

MAVES

The Mid Arun Valley 2015 - 2017

A27 Arundel bypass

Road Options 1, 3 and 5A

Ecological Impact Report

(using current data)



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EXECUTIVE SUMMARY

- The A27 Arundel Improvements Scheme with the finalisation of the routes for the three 'Options', was first made public by Highways England, on their website at the commencement of the Public Consultation on 22nd August 2017.
- The ecological desk study data used to develop and present an assessment of the Options did not include MAVES' 2015-17 data as to what has actually been found in this previously under-surveyed area. This led to many significant omissions and errors of fact and judgement in the Preliminary Ecological Appraisal used for the Consultation.
- This report has been written on behalf of MAVES (Mid Arun Valley Environmental Survey) in order to assess the ecological impact of the three Options including impacts, which would not have been known to Highways England from earlier data.
- The aim of this report is to appraise the potential impacts of the three Options using the most recent data only, which has been collated over the past two years.

The Mid Arun Valley

- The Mid Arun Valley supports fourteen Section 41 Habitats of Principal Importance for the conservation of biodiversity.
- The Mid Arun Valley supports bats, Badger, birds, Dormice, Adder, Grass Snake, Slow Worm, Common Lizard and Water Vole all of which receive legal protection. It supports Brown Hare, European Eel, European Hedgehog, Common Toad and Harvest Mouse, all of which are Section 41 Species of Principal Importance for the conservation of biodiversity.
- With the exception of Badger, which is widespread and common, the populations are considered to be of Regional Importance. Some populations, such as bats, invertebrates and birds may even reach National Importance with further surveys.
- The Mid Arun Valley supports high populations of newts and may support Great Crested Newt, though this species been recorded. It has areas of suitable habitat for breeding Otter, again not recorded.
- All three Options cut through significant areas of the South Downs National Park, though Options 3 and 5A will result in large areas of unspoilt National Park landscape being taken whereas there is already a road cutting through with Option 1.

Option 5A Section 41 habitat impacts - woodland, hedgerows & veteran trees

- The major junction at the western end of the woodland will impact upon an area of ancient woodland comprising a wet woodland mosaic with chalk springs and seepages. This S41 Habitat of Principal Importance is not replaceable with woodland planting. This is not included in the loss of ancient woodland figures.

- The major junction at the western end of the woodland will leave two isolated fragments of woodland. One will be 'sandwiched' between two major carriageways and is likely to degrade over time and lose many species. This is not included in the loss of ancient woodland figures.
- Option 5A will sever the unusual 'W' pattern of woodland at the southern edge of the South Downs National Park. This comprises areas of Section 41 Habitats such as wet woodland, ponds and notable / veteran trees, much of which is irreplaceable.
- Option 5A will sever eleven habitat corridors radiating from the Binsted Woods Complex on the west side of the Arun. Three of these corridors are ancient shaws with streams. Eight of these corridors are hedgerows of which three are likely to be 'important' under the 1997 Hedgerow Regulations. One supports over 100 species of ground flora. Hedgerows such as this are irreplaceable.
- Option 5A will destroy a high number of notable and veteran trees found in areas of woodland in the National Park and tree-lines and ancient shaws. This S41 Habitat cannot be replaced in a lifetime.

Option 5A Section 41 habitat impacts – chalk streams, watercourses, ponds & lowland fen

- Option 5A would disrupt the network of watercourses / ditches that drain the higher land of the Binsted Woods Complex. Some of these watercourses originate in the chalk bedrock draining the South Downs, and two are chalk streams. These are Section 41 Habitats and are irreplaceable.
- The major junction planned at the western end of Option 5A is on the stream / seepage system of the largest chalk stream. This would break the geological situation where saturated gravels carry water from the South Downs.
- This would have impacts on the Binsted Rife Valley which supports uncommon lowland fen and swamp communities which are S41 Habitats, and rare plants such as Blunt-flowered Rush, Fen Bedstraw and Whorl-grass which are all scarce in the county. The Red Data Book Frogbit (listed as Vulnerable) is also in Binsted rife (and Tortington Rife).
- Protected species such as Water Vole and Grass Snake and uncommon birds such as Snipe (Amber List), bats and Nationally Scarce invertebrates have all recently been recorded in this area.
- A second chalk stream originates at Sandy Hole Pond, which is likely fed from an underground spring. It flows through Lake Copse where there are ponds and ancient woodland with a high diversity of beetles (including one Red Data Book species and 8 Nationally Scarce / Notable species) of wet and dry woodland.
- The remaining streams feed into Tortington Rife and into a network of ditches and ponds throughout the area. Additionally, variations in geology / soil type in some areas has created a number of different habitats such as wet woodland, swamp and reedbed and marshy ground.
- Due to these features, some of these areas are unmanaged or seldom managed and therefore of importance to wildlife. Disruption of this system is likely to have a negative impact on Harvest Mice, Water Vole, invertebrates and breeding birds such as Marsh Tit (Red List) amongst many others.
- Many ponds are directly fed by the streams and ditches and so these may disappear with the destruction / disruption of the land drainage system.

Option 5A Section 41 habitat impacts – floodplain grassland, reedbed and river corridor

- The floodplain grazing marsh is part of a corridor from the coast and along the Arun into mid Sussex to areas such as Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks. Option 5A will cause a direct loss of this habitat and present a barrier across the floodplain grassland and associated drainage ditches with ribbons of reedbed.
- Option 5A will result in a small amount of river corridor habitat being lost and possibly rare and uncommon plant species.

Option 5A Section 41 habitat impacts – overview

- A total of ten S41 habitats will be negatively impacted upon by Option 5A, of which five are irreplaceable and one (veteran trees) takes well over one hundred years to replace. It is considered that the entire Binsted Woods Complex is of National Importance and the entire system of seepages, springs, chalk streams, wet woodland, Binsted Rife Valley and spring-fed ponds is of County Importance. The integral landscape is irreplaceable.

Option 5A Protected species impacts – Badger and bats

- Option 5A will destroy one Badger sett and isolate another between two busy carriageways. It will form a barrier through two, possibly three Badger territories. The road will have a high adverse impact on this species. Only the western part of the area has been assessed for this species.
- Thirteen species of bat have been recorded in the Binsted Woods Complex, including the very rare Alcahloe bat and Bechstein's bats and Barbastelles, which are Annex II species. Option 5A would result in the loss of oak woodland in three areas which is important to foraging Bechstein's bats.
- Option 5A would form a barrier between Alcahloe maternity roosts which are in the main block of woodland and that to the west. It would sever flight lines between the main block of woodland and that to the west. It would form a barrier between the main block of woodland and the arms of woodland to the south.
- Option 5A will cut off commuting corridors for bats roosting within the Binsted Woods Complex and foraging elsewhere, and those that roost elsewhere and forage in and around the Binsted Woods Complex such as Serotines from Barnham.
- The bat population is of at least Regional and may prove to be of National Importance. Option 5A will have a high adverse impact on many bat species.

Option 5A Protected species impacts – birds

- Option 5A cuts through a major swan winter roosting site, comprising two fields adjacent to the River Arun, and supporting 200-300 birds each year for over 50 years.
- Option 5A is adjacent to four Barn Owl nesting sites in Binsted; it cuts through an ancient shaw with breeding nightingales; and the proposed bridge across the Arun is just to the north of a large area of reedbed that may support Bittern (Amber List) and Marsh Tit (Red List).
- The number and diversity of birds is such that the Mid Arun Valley populations, when considered as part of the green corridor through the county, may be of National Importance. Option 5A will have a

high adverse impact on groups of birds that are suffering the highest declines such as farmland and wetland species and those that are low-flying such as Barn Owl and swans.

Option 5A Protected species impacts – Dormice, reptiles & Water Vole

- The Binsted Woods Complex is part of the National Dormouse Monitoring Programme. Option 5A will destroy three areas of woodland known to support breeding Dormice. It will sever corridors that allow this species to disperse from a sizable breeding and important core population to smaller woodlands, copses, shaws and outgrown hedgerows within the Mid Arun Valley and beyond, thus impacting on population stability across the landscape.
- Although Option 5A will directly destroy some areas of reptile habitat, the worst impact will be on those that travel furthest, Grass Snake and Adder, because Option 5A will sever the habitat linkages particularly from prime woodland hibernation sites to foraging and breeding areas.
- A major barrier across this landscape is likely to result in high direct mortality and a gradual decrease in the population sizes of all four reptiles.

Option 5A impacts - UKBAP / S41 species

- Water Vole has been recorded at low densities in the area. Option 5A will create an additional road across the floodplain grassland and alter the hydrology of the watercourses to the north of the floodplain grassland. Wetland habitats in Sussex are at 'critical' and yet they are regularly being destroyed, damaged and fragmented by developments such as this.
- Water Vole will likely suffer a high adverse impact, and alteration of this habitat and the ability of this species to disperse effectively may well result in the loss of Water Vole from the Mid Arun Valley area.
- The Brown Hare is known to be across the farmland in the Binsted area and is likely to be across the entire Mid Arun Valley area. The adverse impact is expected to be high for this species has been shown to have high mortality rates on roads and may be lost from the area as a result of Option 5A.
- Option 5A is extremely close to and separates two major Common Toad ancestral breeding sites – the Madonna Pond and Tortington Rife. Option 5A will have a direct negative on Common Toad by dissecting the interconnected terrestrial and wetland habitat resulting in high fatalities. This is likely to have a high adverse impact on the Mid Arun Valley population of Common Toad.
- Hedgehogs have been recorded in the woodland and along footpaths. Option 5A is likely to have a high adverse impact on Hedgehogs which commonly travel up to 2 km per night foraging.
- A good population of Harvest Mouse has been found in a field to the south of Option 5A. There is suitable habitat throughout the area and this species has been recorded in the Binsted Woods Complex to the north of the proposed route of Option 5A. This will sever dispersal corridors and is likely to have a high adverse impact on this species.
- Mitigation measures such as green bridges and underpasses will not be effective and stem the flow of the loss of species from the area as a result of a major carriageway without barriers to prevent protected mammals, amphibians and reptiles crossing the road.

Option 5A impacts - invertebrates

- The mosaic of habitats and rare habitats such as wet woodland, veteran trees and wetland together with sheltered 'edge' habitats has resulted in a very high diversity of invertebrates. Two of the invertebrate surveys carried out demonstrate this. A general invertebrate survey found 551 species (including 28 Nationally Scarce species, three S41 species and 6 Red Data Book species). A survey of Lake Copse and 2 hedgerows found 230 beetle species including 10 Nationally Scarce species and 3 species new to Sussex.
- Twenty-seven species of butterfly are consistently recorded each year, which includes the Purple Emperor (IUCN Red List – Near Threatened), and Dingy Skipper and White Admiral, which are both Section 41 Species.
- The diversity of invertebrates is such that, with continued new findings, or surveys of the floodplain areas, it may be that the status is elevated to National Importance.
- Option 5A would have the highest adverse impact in areas of wet woodland with streams and seepages which have high numbers of notable invertebrates. It would also impact on the dead wood habitat that yielded a high number of saproxylic invertebrates, which is our rarest invertebrate group. These habitats are non-replaceable / non-replicable, or take hundreds of years to replace and therefore cannot be mitigated for.

Option 5A avoidance of western block of woodland

- The possibility of placing the western end of Option 5A between the two blocks of woodland would have a high negative impact on both woodlands, a chalk spring-fed pond and chalk stream, Dormice, commuting bats, Alcatloe bats commuting between nursery roosts, Hedgehogs and Badgers.
- This was considered in 1993 by the then Secretary of State to be unacceptable. It was reasoned that in time the Yapton Lane junction would be redesigned to be similar to that currently proposed, with its associated ecological harm. This would therefore ultimately lead to an escalation in long-term damage to the environment.

Option 3 Section 41 habitat impacts - woodland, hedgerows & veteran trees

- Option 3 would result in a significant loss of approximately 24 ha of diverse woodland. It would sever the stream network and the ancient trackway, Old Scotland Lane, which boasts a huge diversity of sedges and butterflies (including Red Data Book and UKBAP / S41 species) along its length.
- Option 3 would create a large amount of woodland 'edge' along the carriageway. This would not be the same quality as 'edge' habitat adjacent to fields, as it will be prone to dust and pollutants.
- Option 3 would sever five hedgerows to the west of the Arun, two of which serve as corridors from the woodland.
- It is likely that a number of important and irreplaceable veteran trees will be in the pathway of Option 3 as this traverses such a big and uninterrupted block of ancient woodland.

Option 3 Section 41 habitat impacts – watercourses & ponds

- Option 3 traverses 3 main watercourses that are possibly in part spring fed and drain the Binsted Woods Complex feeding through to the Madonna Pond and The Lag, Tortington Rife and a number of ponds in various locations in Tortington.
- Disruption of this system is likely to have a negative impact on species-rich wet fields, wet woodland, Common Toad, Harvest Mice, Water Vole, invertebrates and breeding birds such as Marsh Tit (Red List).
- Many of the ponds are directly fed by the streams and ditches and so these may disappear with the destruction / disruption of the land drainage system. The Madonna Pond is of particular importance as this appears to be a major breeding site for Common Toad (along with Tortington Rife).
- The ditch and pond network throughout a large section of the Mid Arun Valley could be lost fully / partially or subjected to differing water regimes. It is also likely to suffer from pollutants from the proposed road.

Option 3 Section 41 habitat impacts – floodplain grassland, reedbed and river corridor

- The floodplain grazing marsh is part of a corridor from the coast and along the Arun into mid Sussex to areas such as Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks. Option 5A will cause a direct loss of this habitat and present a barrier across the floodplain grassland and associated drainage ditches with ribbons of reedbed.
- Option 3 will result in a small amount of river corridor habitat being lost and possibly rare and uncommon plant species.

Option 3 Section 41 habitat impacts – overview

- A total of eight S41 habitats will be negatively impacted upon by Option 3, of which three are irreplaceable and one (veteran trees) takes well over one hundred years to replace. It is considered that the entire Binsted Woods Complex is of National Importance and that the large amount of woodland loss and degradation is unacceptable.

Option 3 Protected species impacts – Badger and bats

- Option 3 will create a barrier to bat movement through the entire block of the Binsted Woods Complex and to the surrounding habitats from the isolated eastern end of the woodland.
- The severance of the woodland by a major road will reduce the foraging habitat for species that will not cross this barrier, thereby impacting upon the viability of the fragmented population. The greatest impact will be on Bechstein's bats (Annex II species). This species forages within mature native woodland, notably oak woodland, and is reluctant to leave an area of continuous canopy cover.
- A more serious impact on Bechsteins is the location of the road, which will form a barrier between a Bechstein's maternity roost along the southern edge of Tortington Common and two other roosts in Stewards Copse. Bechstein's bats will routinely move between roost sites.
- The bat population is of at least Regional and may prove to be of National Importance. Option 3 will have a high adverse impact on many bat species.

Option 3 Protected species impacts – birds

- Option 3 is likely to have a high adverse impact on woodland birds including those of coniferous woodland. It is likely to have a high adverse impact on other groups of birds such as wildfowl and wetland species and low-flying species.
- Option 3 cuts through a major swan winter roosting site in fields adjacent to the River Arun, supporting 200-300 birds each year for over 50 years. The proposed bridge across the Arun is just to the north of a large area of reedbed that may support Bittern (Amber List) and Marsh Tit (Red List).
- The number and diversity of birds is such that the Mid Arun Valley populations, when considered as part of the green corridor through the county, may be of National Importance. Option 3 will have a high adverse impact on groups of birds that are suffering the highest declines such as farmland and wetland species and those that are low-flying such as swans.

Option 3 Protected species impacts – Dormice, reptiles & Water Vole

- The Binsted Woods Complex is part of the National Dormouse Monitoring Programme. They are known through several areas in the woodland and are likely to be throughout the entire woodland.
- Option 3 will isolate Dormouse populations that will be unable to disperse further than the existing A27 to the north, the River Arun and Arundel to the east (south east) and the Option 3 route to the south and west.
- It is likely that all four reptiles in the area are present in the pathway of Option 3, although this route Option is likely to have a higher negative impact on Adder, which is the least common of these reptiles, and routinely seen in woodland clearings.
- Reptiles will move through and inhabit the more open areas of the woodland such as glades, wayleaves and footpaths, of which Option 3 severs several. It is likely to result in high mortality of reptiles.
- Water Vole has been recorded at low densities in the area. Option 3 will create an additional road across the floodplain grassland and alter the hydrology of the watercourses to the north of the floodplain grassland. Wetland habitats in Sussex are at 'critical' and yet they are regularly being destroyed, damaged and fragmented by developments such as this.
- Water Vole will likely suffer a high adverse impact, and alteration of this habitat and the ability of this species to disperse effectively may well result in the loss of Water Vole from the Mid Arun Valley area.

Option 3 impacts - UKBAP / S41 species

- Option 3 is likely to have an adverse impact on the known population of Brown Hare in the area due to high road mortality and habitat fragmentation.
- Common Toad is throughout the Binsted Woods Complex and the surrounding area. It is likely to also be in ditches to the east of the Arun. Option 3 will sever corridors between foraging and breeding areas in a large part of the Mid Arun Valley area.

- Hedgehog populations are likely to be highest in the Binsted Woods Complex and Option 3 would pose a significant barrier to dispersal through the woodland and result in an unacceptable level of road deaths.
- Option 3 is likely to impact upon watercourses that contribute to a known area of Harvest Mouse habitat and sever potential open dispersal corridors through the Binsted Woods Complex.

Option 3 impacts - invertebrates

- The mosaic of habitat types in the Binsted Woods Complex with damp wayleaves, glades, ephemeral ponds, streams and veteran trees has resulted in a high invertebrate diversity with a beetle survey finding 400 species including 27 Nationally Scarce / Red Data Book species.
- Old Scotland Lane is indeed rich in butterflies for White Admirals (UK BAP / S41 species) and Silver-washed Fritillaries are frequently seen together with Purple Emperors (Red List NT).
- Option 3 would result in a significant loss of woodland that would have a direct negative impact on this diversity. Option 3 may also interfere with the ability of species to the east of the potential carriageway to disperse through the woodland and ultimately along habitat corridors.
- Option 3 may have an impact on invertebrates in the floodplain grassland ditches by destroying corridors and degrading habitat.

Option 1 Section 41 habitat impacts - woodland, hedgerows & veteran trees

- Option 1 will require road widening along part of the Rewell Wood Complex LWS, the Binsted Woods Complex and a small fragment of woodland amounting to 5.5 ha of woodland loss along woodland edge habitat.
- Woodland edge can have an extremely high diversity of species due to higher light levels and a mixture of woodland plants and plants from additional habitats, though it is not likely to support any rare or notable species. Option 1 is unlikely to negatively impact upon this 'edge' diversity, as it will readily re-establish, though there will be a woodland 'take' as the woodland interior will become 'edge.'
- Option 1 would result in the loss of very scrubby and gappy hedgerows along the current A27 and the loss of short gappy hedgerows across the floodplain.
- There may be some notable and veteran trees along the edge of the woodlands, though this has not been investigated.

Option 1 Section 41 habitat impacts – floodplain grassland, reedbed and river corridor

- The floodplain grazing marsh is part of a corridor from the coast and along the Arun into mid Sussex. Option 1 will cause a direct loss of this habitat and present a barrier across the floodplain grassland and associated drainage ditches with ribbons of reedbed.
- Option 1 will result in a small amount of river corridor habitat being lost and possibly rare and uncommon plant species.

Option 1 Section 41 habitat impacts – overview

- A total of seven S41 habitats will be negatively impacted upon by Option 1, one of which, ancient woodland, is irreplaceable and veteran trees (if present) will take well over one hundred years to replace.

Option 1 Protected species impacts – Badger and bats

- It is unlikely that Badgers would venture across the A27 to forage with ample foraging habitat to the north and to the south, and so it is highly unlikely that Option 1 would provide a barrier across territories. However, it is likely that there will be the loss of foraging habitat and possibly setts if these are present in banks along the current carriageway.
- Bats are abundant in both the Binsted Woods Complex and the Rewell Woods Complex, yet it is currently unknown whether there is movement between these two areas of woodland. If movement were to occur, it is likely that bats would cross the current A27 at its narrowest point with the most canopy cover.
- If bats were regularly moving between the Binsted Woods Complex and the Rewell Woods Complex, the widening of the carriageway would present a significant barrier to this movement.

Option 1 Protected species impacts – birds

- Option 1 is likely to have an adverse impact on woodland birds and wetland and wildfowl species with some loss of nesting habitat for passerines along scrubby edge habitat. It may impact upon some woodland species at the edge of the woodland blocks.
- Option 1, as with all the road Options, may have a negative impact on the Mid Arun Valley as part of an integrated corridor for birds from the coast and along the Arun into mid Sussex.

Option 1 Protected species impacts – Dormice, reptiles & Water Vole

- Dormice are known to be breeding throughout the Binsted Woods Complex and the Rewell Woods Complex and so removal of some of the woodland may result in the removal of Dormouse breeding habitat. It is unlikely, however, that this woodland removal will have any impact on dispersing Dormice or corridors for dispersal as the current A27 already forms a barrier to movement for this species.
- Option 1 is likely to isolate populations of reptiles between two roads, but unlikely to have a significant impact upon reptile movement across the landscape as there is already a barrier to dispersal in the form of the current A27 for north-south movement. However, whilst presently there may be very occasional movement, this will not be possible in the future without mitigation in the form of bridges.
- Option 1 traverses an area of sub-optimal Water Vole habitat but will significantly impact upon movement across the landscape as it would provide another set of 'pinch points' in the form of culverts with a relatively small area of floodplain grassland sandwiched between two roads.

Option 1 impacts - UKBAP / S41 species

- Option 1 is likely to have an adverse impact on the known population of Brown Hare in the area due to high road mortality and habitat fragmentation.
- Option 1 may sever connections between possible breeding sites and suitable terrestrial habitat for Common Toad. It will also lessen the ability for this species to disperse along the Arun Valley.
- Option 1 may result in an increase in Hedgehog road mortality, particularly in the area of new road construction across the floodplain grassland.
- Harvest Mouse may be in the areas to be impacted by Option 1, though it is unlikely because the habitat is sub-optimal.

Option 1 impacts - invertebrates

- The current A27 road verges are likely to support a high diversity of invertebrates, though a low number of notable or rare invertebrates. The invertebrate community in these areas is likely to re-establish fully.
- The wet ditches in the floodplain grassland have the highest potential to support rare invertebrate species and although Option 1 will not destroy these habitats entirely, it may degrade the habitat.

The three Options

- The Mid Arun Valley supports thriving populations of most protected species and a high number of S41 Habitats. Compared with most areas of the British countryside the diversity in this area is outstanding.
- It is clear that Options 3 and 5A are extremely damaging in terms of the size and number of Section 41 habitats destroyed, the number of species directly impacted and indirectly impacted upon and the ability for species to move across the Mid Arun Valley area and the wider landscape with very real threats to long-term viability.
- Option 1 would result in the felling of fewer trees, less land grab, far less loss of irreplaceable habitats, less severance of habitat, habitat corridors and flight lines.

Habitat corridors

- The Mid Arun Valley forms a continuation of an exceptionally diverse river corridor that is relatively uninterrupted from the middle of Sussex to the English Channel. It is the presence of good quality habitats, the proximity to other good quality habitats and the lack of barriers to dispersal that has resulted in the diverse range of species observed in the Mid Arun Valley area.
- All three Options result in a degree of severing dispersal corridors, though Option 5A would, in effect, isolate the entire woodland from the surrounding landscape. The 11 habitat corridors from the Binsted Woods Complex link to the surrounding habitats and subsequently link the surrounding habitats to each other and further afield. This forms an important integrated network of habitat linkages.

- Option 3 would sever this uninterrupted block of woodland into two and, in effect have the same, but lesser isolation impact which would be restricted to the eastern part of the woodland.
- All three Options would result in an additional significant barrier across the Arun floodplain corridor that extends from Mid Sussex to the coast.

Mitigation and fragmentation

- Proposed mitigation is primarily concerned with the direct loss of ancient woodland due to compensation costs. There is no account given to degradation, fragmentation and the loss of irreplaceable habitats such as chalk streams and veteran trees.
- Mitigation does not compensate for this habitat fragmentation and even when green bridges and culverts are constructed there is little evidence that these are compensatory.
- The problems with habitat fragmentation and the importance of habitat connectivity and corridors has increasingly been a focus for planning and action, culminating in the national 'Making Space for Nature' Lawton report (2010). The report promotes four essential principles for future nature conservation in the UK: bigger, better, more, and joined-up.
- The interruption of these large and secure populations in the Mid Arun Valley is likely to have very real cumulative and significantly adverse impacts on Regionally and possibly Nationally Important populations. The area will likely become impoverished in comparison to its current status.
- If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused (PPS9).
- This survey has demonstrated that effective mitigation will not be possible, and that Option 1 is by far the least damaging Option, but even so, will not be achieved without a severe and significant negative impact upon the Arun corridor and the north – south dispersal of many protected species.

1 INTRODUCTION

BACKGROUND TO THE STUDY

- 1.1 The A27 Arundel Improvements Scheme, showing the final routes for Options 1, 3 and 5A, was first made public by Highways England on their website at the commencement of the Public Consultation on 22nd August 2017.
- 1.2 The ecological desk study data used to develop and present the Options did not include MAVES' 2015-17 data as to what has actually been found in this previously under-surveyed area. This led to many significant omissions and errors of fact and judgement in the Preliminary Ecological Appraisal used for the Consultation.
- 1.3 This report has been commissioned by MAVES, Mid Arun Valley Environmental Survey, to assess the ecological impact of all the route Options including impacts which would not have been known to Highways England from earlier data.

AIMS

- 1.4 The aims of this survey are as follows:
- To collate the most relevant and up to date data from two years of survey work in the Mid Arun Valley
 - To use the current data to assess the likely impacts of the three route Options on protected species and Habitats of Principal Importance.

THE MID ARUN VALLEY

- 1.5 The Mid Arun Valley landscape is one of ancient semi-natural woodland, floodplain grassland, small grassy and tussocky fields, arable fields with wide, grassy margins, valley streams surrounded by swamp, fen and marsh and a scatter of ponds and ancient trees. These habitats are both linked and separated by a network of wet ditches, streams, shaws, hedgerows and treelines.
- 1.6 A network of streams and ditches, some arising in springs and seepages with their origin being the South Downs, drains the northern part of the area. These mostly arise within and extend from the Binsted Woods Complex where they eventually meet with the drainage ditches dissecting the floodplain grassland.
- 1.7 The Binsted Woods Complex is a Local Wildlife Site and situated within the South Downs National Park. This woodland block and much of the surrounding habitat comprises fourteen different Section 41 Habitats of Principal Importance for the conservation of biodiversity.

- 1.8 It has excellent connectivity to similar habitat along the Arun, Local Wildlife Sites (LWS), a privately owned wildlife site and Sites of Special Scientific Interest (SSSI). This has resulted in an extremely high number of rare and threatened species in the area.

THE THREE OPTIONS

- 1.9 The three proposed route Options traverses are shown in Figure 1.

Figure 1: The three potential A27 route Options



- 1.10 All three Options will traverse the Arun floodplain at which point Option 1 re-joins the existing A27 through the South Downs National Park. Options 3 and 5A traverse unspoiled areas of the National Park.
- 1.11 Option 3 would divide the Binsted Woods Complex into two whereas Option 5A would skirt around much of the main woodland block, though leaving two isolated woodland fragments.
- 1.12 All route Options would create a major barrier across the floodplain grassland and Options 3 and 5A would create barriers though the woodland and from the woodland across the landscape.

2 METHODS

HABITAT SURVEYS

Phase 1 habitat survey

- 2.1 Much of the Phase 1 habitat survey was completed in 2015 / 2016 (Thompson 2016). Further surveys were completed in 2017 and this report collates all the information gathered.
- 2.2 Phase 1 surveys followed the standard methodology (JNCC, 2010). In summary, this comprised walking over the survey area and recording the habitat types, species and boundary features present.
- 2.3 In addition, the habitats within the survey area were assessed for their potential to support legally protected or otherwise notable flora and fauna. Where species were seen or heard these were recorded.
- 2.4 Where suitable habitat was identified on site, a search was conducted for signs indicating the presence of protected species such as droppings, burrows, tracks and evidence of feeding. Further surveys were carried out where possible.

Recording notable trees

- 2.5 Trees have been categorised according to diameter at breast height (DBH), which generally serves as a good indication of age. Size classifications used are shown in Table 1. Many trees that have been recorded as 'notable', due to the fact that they have not reached a size to indicate truly significant age, are none-the-less extremely old and have veteran features that are of importance to wildlife.
- 2.6 The tree locations have been recorded with hand-held GPS devices. The locations of the trees therefore may be accurate within a 5-10 m range.

Table 1: Classification sizes for notable trees

DBH - metres	Classification
1 – 1.4	Notable
1.5 – 1.6	Veteran
1.7 +	Ancient

Discussion of the impacts of the various route Options

- 2.7 The route Options are discussed in Section 5 in the order of those with the most habitats to be impacted upon. Option 5A is followed by Option 3 and finally Option 1.
- 2.8 Many aspects are discussed regarding Option 5A and referred to in the subsequent sections in order that impacts do not become too repetitive. This includes potential mitigation if it is the same or similar.

ADDITIONAL SURVEYS

2.9 A number of specific surveys have been undertaken by professional ecologists, experts and county recorders as follows:

- Bats – Daniel Whitby (AEWC), 2016 and 2017;
- Badger – Dominic Walding (undergraduate project) supervised by Dr Dawn Scott;
- Beetles – Dr Katherine Grove 2016;
- Birds – David and Heather Hart 2015, Ben Knight 2017;
- Butterflies – John Knight 2017;
- Botanical surveys – Frances Abraham, Nick Sturt and other members of the Sussex Botanical Recording Society;
- Dormouse – Ian Powell as part of the National Dormouse Monitoring Programme;
- Dormouse - James Burford (undergraduate project) supervised by Dr Dawn Scott;
- Fungi – Bill Young 2016;
- Harvest Mouse - Sam Buckland, Lucy Groves and Ian Powell, 2016;
- Invertebrates – Mike Edwards with Peter Hodge and Graeme Lyons, 2016 and 2017;
- Invertebrates – Nathalie GuerIn 2015 and 2017; and
- Freshwater invertebrates – Bill Young 2015 and 2016.

2.13 Additional to the 'targeted' surveys, records have been collated on an 'ad hoc' basis from interested parties, local residents, woodland owners and Arundel residents.

Survey data

2.14 Data collated for this report has been taken from a number of different surveys as outlined in Section 2.7 and referenced in Section 7. Data additional to these reports is available on request in an excel spreadsheet.

Use of nomenclature

2.15 Plant nomenclature in this report follows Stace (2010) for native and naturalised species of vascular plant.

2.16 For all species the scientific name is given once and then not repeated again. Some of the rarer invertebrates do not have a 'common' name and so, in these cases, just the specific name is used.

SURVEY LIMITATIONS

2.17 It must be taken into account whilst reading this report that most of the survey effort has been concentrated around the west part of the survey area, particularly Option 5A and to a lesser extent Option 3.

2.18 The floodplain grassland and ditches to the east of the Arun could not be surveyed due to lack of access and much of the area was viewed with binoculars from Public Rights of Way.

- 2.19 This amounts to the main part of Option 1, traversing unspoiled habitat across the floodplain grassland, not being surveyed.

3 RESULTS

HABITATS

3.1 The habitat survey considers the entire survey area across the Mid Arun Valley and shown in the Phase 1 habitat map in Appendix 1. It is an extremely diverse landscape comprising an interconnected mosaic of habitats, many of which are Section 41 Habitats of Principal Importance (formerly Priority Habitats). The following habitats have been recorded in the survey area:

- ancient semi-natural woodland;
- woodlands and shaws;
- hedgerows;
- notable and veteran trees;
- orchard;
- plantation woodland;
- ruderals and scrub;
- scattered trees and tree-lines;
- arable field margins;
- grassland;
- lowland meadow;
- chalk streams;
- drainage ditches and streams;
- ponds;
- lowland fen, swamp and reedbed
- coastal and floodplain grazing marsh; and
- river corridor.

Ancient semi-natural woodland

3.2 The Binsted Woods Complex is a complex of woodland sites and is the largest area of woodland to the south of the A27 along the West Sussex coastal plain. The site supports ancient woodland, conifer plantation, species-rich pasture and ancient tracks. This mixture of habitats coupled with the geology has resulted in the extremely diverse flora resulting in its Local Wildlife Site designation.

3.3 The woodland varies greatly in nature, though the main National Vegetation Communities found are W10 *Quercus robur* – *Pteridium aquilinum* – *Rubus fruticosus* woodland with localised areas of W8 *Fraxinus excelsior* – *Acer campestre* – *Mercurialis perennis* woodland and small pockets of W16 *Quercus* spp. – *Betula* spp. – *Deschampsia flexuosa* woodland.

3.4 The main canopy species are Pedunculate Oak *Quercus robur* and Ash *Fraxinus excelsior* with localised stands of tall Birch *Betula* spp. and occasional Beech *Fagus sylvatica* and Hornbeam *Carpinus betulus*. The structure of the woodland is extremely variable with a shrub layer sometimes dominated by over-stood coppiced Hazel *Corylus avellana* with Sweet Chestnut

Castanea sativa in places or with dense thickets of Holly *Ilex aquifolium* and even vigorous growth of Field Maple *Acer campestre*.

- 3.5 Areas of plantation woodland are also interesting with coniferous species giving way to deciduous woodland with the ground flora forming a mosaic of species of acidic and more base rich communities. Species such as Yellow Pimpernel *Lysimachia nemorum* and Enchanter's-nightshade *Circaea lutetiana* are growing alongside plants and bryophytes of acidic conditions such as Tormentil *Potentilla erecta* and bryophytes such as *Polytrichastrum formosum* and *Hypnum jutlandicum*.
- 3.6 In some small openings the vegetation would best be described as lowland heath with open areas dominated by Bracken *Pteridium aquilinum* and associates such as Heather *Calluna vulgaris*.
- 3.7 The field layer is dissected by streams, banks, craters and ancient tracks and is, in places, breathtakingly diverse, particularly around Furzefield Copse and the western end of the woodland, extending into Ash Piece. Stands of Bluebells *Hyacinthoides non-scripta* are intermixed with a great variety of woodland plants including less common species such as Southern Wood-rush *Luzula forsteri* and Orpine *Sedum telephium* as well as a range of species indicative of ancient woodland.
- 3.8 There are localised flushes of wet woodland, particularly in Hundred House Copse and Little Danes Wood where there are pockets of Alder carr surrounding chalk springs. Here the community moves towards the more unusual W7 *Alnus glutinosa* – *Fraxinus excelsior* – *Lysimachia nemorum* woodland. The field layer is rich in flowering plants and bryophytes with a hundreds of Early-purple orchids *Orchis mascula* and less common bryophytes such as *Trichocolea tomentella* (more common in the wetter west) and *Neckera complanata*, a species of base rich conditons.
- 3.9 Another extremely interesting pocket of wet woodland is in Tortington Common forming a small area of W4 *Betula pubescens* – *Molinia caerulea* woodland. The ground flora is dominated by Purple Moor-grass *Molinia caerulea* with associates such as Sphagnum mosses, sedges (of acidic substrates) and Cross-leaved Heath *Erica tetralix* beneath a canopy dominated by Downy Birch *Betula pubescens*.
- 3.10 More robust species in the field layer include ten species of ferns from a variety of habitats including Narrow Buckler-fern *Dryopteris carthusiana* found in wet woodland and fens; Soft Shield-fern *Polystichum setiferum*, which is a moderate calcicole; and Polypody *Polypodium vulgare*, a rhizomatous species of well-drained, predominantly acidic substrates.
- 3.11 There is great variation in the size classes of trees, but there are some stands dominated by mature Pedunculate Oak (with a diameter of 0.9 m – 1 m) and some ancient Ash and Sweet Chestnut coppice stools as well as a scatter of notable, ancient and veteran trees throughout, but particularly frequent around Lake Copse and The Shaw where Pedunculate Oak and Ash trees frequently have a trunk diameter of over 1.4 m.

Woodlands and shaws

- 3.12 Wooded corridors (shaws) radiate out from the Binsted Wood Complex across the surrounding countryside and, on occasion, these widen into small pockets of woodland. Many support a diverse assemblage of native species and good numbers of mature, notable and veteran Oaks.
- 3.13 The Shaw and The Lag are remnants of ancient woodland (shown in Figure 2), now in-filled and forming woodlands, radiating from the Binsted Woods Complex. Together with Lake Copse all three areas of woodland follow watercourses and, as such they have features such as wet flushes, ponds and winter wet areas with localised growth of Grey Willow *Salix cinerea* and a wetland ground flora. They form a distinctive and very diverse woodland feature of the Mid Arun Valley.

Figure 2: The Shaw and The Lag in 1876



Map taken from a copy of *Sussex LXII* (includes: Aldingbourne; Barnham; Eastergate; Walberton; Yapton.) Surveyed: 1875 to 1876 and published: 1880

- 3.14 These wooded areas tend to have a good shrub layer and a high number of Ancient Woodland Indicators such as Butcher's-broom *Ruscus aculeatus*, Pignut *Conopodium majus*, Primrose *Primula vulgaris* and Hart's-tongue *Asplenium scolopendrium*.

Hedgerows

- 3.15 Hedgerows heavily dissect the landscape to the south of the Binsted Wood Complex and that surrounding the village of Binsted. They are less frequent towards the eastern side of the survey area though they follow Tortington Lane and Ford Road.

- 3.16 Approximately sixty hedgerows were surveyed of which nearly half supported an average of four or more woody species in a 30 m stretch. A third of the hedgerows surveyed qualify as 'Ancient and / or species-rich hedgerows' of which at least half would classify as 'important' under the Hedgerow Regulations 1997.
- 3.17 The hedgerows surveyed support a good range of woody species with Hawthorn *Crataegus monogyna*, Hazel and Blackthorn *Prunus spinosa* being the most frequently occurring species. Other species include Field Maple *Acer campestre*, English Elm *Ulmus procera*, Ash and Pedunculate Oak as well as those indicative of base-rich soils such as Spindle *Euonymus europaeus*, Wayfaring-tree *Viburnum lantana* and Guelder-rose *Viburnum opulus*.
- 3.18 Many of the hedgerows have standard trees including notable and veteran trees, and some have some old coppiced stools of Hazel. Woody climbers such as Dog-rose *Rosa canina* and Field-rose *Rosa arvensis* also contribute to the structure and diversity of the hedgerows.
- 3.19 The main structure of the hedgerows ranges from clipped and dense to overgrown and defunct and becoming invaded by Bramble. Other hedgerows have developed into tree-lines with natural shrub invasion at the base of the trees. Approximately half of the hedgerows surveyed had features of importance to wildlife such as banks, ditches and standard trees.
- 3.20 The hedgerows along the existing A27 are very gappy and infilled with dense stands of Bramble. In places they are reduced to scattered overgrown shrubs / scrub with species such as Hawthorn and Blackthorn.

Notable / veteran trees

- 3.21 A total of 180 notable trees were recorded in the Mid Arun Valley area (though there are many more), of which 125 were classified as notable, 30 as veteran and 25 as ancient. Such trees are throughout the landscape, some in the Binsted Woods Complex, others in the shaws extending from the woodland and many in fields and hedgerows.
- 3.22 The most frequently occurring species are Pedunculate Oak occurring as single-stemmed trees and Ash, which is usually multi-stemmed. Other species include Beech, Sweet Chestnut, Hazel, Field Maple and, uncommonly a single tree of Wild Cherry *Prunus avium*.
- 3.23 It must be noted that the trees have been classified purely on size and of the 125 notable trees recorded approximately 90 % do have 'veteran' features of importance to wildlife such as dead wood, lifted bark, holes and water filled hollows.

Orchard

- 3.24 There are three orchards within the Mid Arun Valley area, one of which at Lake Copse has 350 trees of mixed varieties in sheep-grazed grassland. Another is in Tortington to the west of Tortington Manor.
- 3.25 The orchard at Meadow Lodge is smaller with older trees of Apple *Malus sylvestris s.l.*, Pear *Pyrus communis s.l.* and Cherry *Prunus sp.*, again in grassland that is occasionally grazed by sheep. Some of these trees have hollows and are gnarled and twisted.
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Plantation woodland

- 3.26 Small stands of plantation woodland are scattered throughout the area such as around the golf course at SU 97824 06489, SU 981 060, SU 98054 05917, SU 98162 06036 and SU 98039 06316. These tend to be reasonably young and support species such as Ash, Field Maple, lime *Tilia* sp., cherry *Prunus* sp., Hornbeam and Pedunculate Oak.
- 3.27 The field layers support mostly robust herbaceous species such as Cow Parsley *Anthriscus sylvestris* and Red Campion *Silene dioica* with species indicative of nutrient enrichment such as Common Nettle *Urtica dioica*. Woodland plants occur in areas near mature woodland or hedgerows and include Lords-and-Ladies *Arum maculatum*, Dog's Mercury *Mercurialis perennis* and ferns such as Hart's-tongue.
- 3.28 Other small wooded areas are scattered around such as at SU 98478 06057 and at Marsh Farm (SU 98936 04834). The largest area of plantation woodland is just to the north of the railway line at SU 99023 04455 around the reservoirs. This is mixed deciduous woodland that is approximately 15 years old with a very varied field layer.

Scattered trees

- 3.29 Aside from notable, veteran and ancient trees, trees are scattered throughout the area mostly in hedgerows and some smaller trees in hedgerows / scrub lines along the A27. Species include Ash, Pedunculate Oak and Wild Cherry. Some of the tree lines around Binsted Village support mature trees of Pedunculate Oak with a trunk diameter of 0.7 m to 0.9 m, which will serve as the next generation of veteran trees.
- 3.30 Some trees are reasonably young such as those along the hedgerows at grid references SU 98451 06330 and SU 98691 06171. There are also clusters of trees that have been planted around the golf course and in small fields such as those at grid references SU 98502 06073, SU 98637 05961 and SU 99361 05429, the last of which includes a range of fruit trees.
- 3.31 As part of a Mid Arun Valley Environmental Survey MAVES community project, Black Poplar *Populus nigra* saplings have been planted at Noor Wood SU 997064, Manor House SU 993060, Meadow Lodge SU 993056, Kents Cottage SU 990057 and Mill Ball SU 989056 and SU 987056.

Ruderals and scrub

- 3.32 Ruderals are scattered throughout the area, mostly forming small stands in copses or at the edges of arable fields. The most common species are Common Nettle, Curled Dock *Rumex crispus* and Broad-leaved Dock *Rumex obtusifolius*.
- 3.33 Ruderals and scrub are found along the margins of the existing A27 where they are intermixed with grassland and woodland species.
- 3.34 Pockets of scrub mostly dominated by Bramble and Grey Willow are scattered throughout the area along ditches, fence lines and field corners. Bramble is also found infilling gaps in hedgerows.

Arable field margins

- 3.35 Many of the arable fields have wide margins of up to 20 m supporting a good range of vegetation. Some areas have tall rough grassland with robust plants such as Cow Parsley and Common Nettle. Other areas support a good range of smaller grassland herbs such as Smooth Tare *Vicia tetrasperma*, White Clover *Trifolium repens*, Cut-leaved Crane`s-bill *Geranium dissectum*, Common Mouse-ear *Cerastium fontanum*, Lesser Stitchwort *Stellaria graminea* and Lesser Trefoil *Trifolium dubium*.
- 3.36 Orchids such as Common Spotted-orchid *Dactylorhiza fuchsii* and Early-purple Orchid are locally abundant. The fields themselves support occasional arable weeds such as Common Poppy *Papaver rhoeas*, Red Dead-nettle *Lamium purpureum* and Cornflower *Centaurea cyanus*, which is scarce in Sussex and listed on the Sussex Rare Species Inventory (SxRSI).

Grassland

- 3.37 The grassland surveyed ranged from a sward mostly dominated by Perennial Rye-grass *Lolium perenne* to damp grassland and rough tussocky grassland. The most common communities are MG7 *Lolium perenne* leys and related grasslands and, in damper areas MG10 *Holcus lanatus*-*Juncus effusus* rush-pasture.
- 3.38 In some areas where herbaceous species are more frequent, the grassland approaches the NVC type MG6 *Lolium perenne*-*Cynosurus cristatus* grassland, although this is patchy in extent. Other fields are seldom-managed rough grassland of the NVC type MG1 *Arrhenatherum elatius* grassland with a good number of herbaceous species.
- 3.39 A damp field to the west of Tortington Rife has damp grassland intermixed with wetland species with a reasonably diverse assemblage including Common Knapweed *Centaurea nigra*, Yarrow *Achillea millefolium* and Cut-leaved Crane`s-bill *Geranium dissectum* alongside wetland species such as Wild Angelica *Angelica sylvestris* and Hemlock Water-dropwort *Oenanthe croccata*.

Lowland Meadow

- 3.40 A species-rich field is on the outskirts of Arundel adjacent to Steward`s Copse. It supports a diverse assemblage of herbaceous species such as Eyebright *Euphrasia nemorosa*, Autumn Hawkbit *Scorzoneroides autumnalis*, Common Bird`s-foot-trefoil *Lotus corniculatus* and Red Bartsia *Odontites vernus*. It is most similar to the NVC type MG5 *Cynosurus cristatus* – *Centaurea nigra* grassland. This is an old meadow assemblage and a S41 Habitat of Principal Importance.

Chalk streams

- 3.41 Binsted Rife is a chalk stream fed from the drainage of the South Downs. As a consequence aquatic and emergent species indicative of calcareous conditions are present such as *Ranunculus circinatus* Fan-leaved Water-crowfoot, which is declining throughout its range, Flowering-rush *Butomus umbellatus* and Mare`s-tail *Hippuris vulgaris*.
- 3.42 An additional chalk stream originates above the ground at Sandy Hole Pond, at the edge of Binsted Lane by Barns Copse. This tracks along boundaries, disappearing beneath the ground
-

for a stretch along Copythorn Field west hedge. It passes through Lake Copse woodland feeding a pool and a large pond and continues along ditches in the area.

- 3.43 The influence of the chalk is visible in Sandy Hole Pond due to the abundance of the Nationally Scarce and Sussex Scarce (SxRSI) Water Soldier *Stratiotes aloides*, a species indicative of calcareous water, but is soon lost presumably due to the influence of the local geology.

Drainage ditches and streams

- 3.44 Ditches and streams are throughout the area with some originating in the South Downs, others draining the Binsted Woods Complex and possibly with some influence from the South Downs and others surrounding the River Arun.
- 3.45 Generally, the vegetation along the ditches is variable with some areas dominated by reedbed, others with robust species such as Hemlock Water-dropwort and Great Willowherb *Epilobium hirsutum*. Others are poached by cattle leaving bare mud for colonisation by less common species such as Whorl-grass *Strigosa Paraphilias* (SxRSI).
- 3.46 Streams flow through the distinctive three arms of woodland extending to the south of the Binsted Woods Complex. The Shaw and The Lag are fed from ditches / watercourses traversing the Binsted Woods Complex.
- 3.47 The Lag (and possibly The Shaw) feed into Tortington Rife, which supports a good arrange of aquatic and emergent species including Frogbit *Hydrocharis morsus-ranae*, listed on the Sussex Rare Species Inventory (SxRSI), Celery-leaved Buttercup *Ranunculus sceleratus* and Water Mint *Mentha aquatica*.
- 3.48 The ditches that dissect the floodplain grassland were not surveyed due to lack of access.

Ponds

- 3.49 A great diversity of ponds litter the landscape and vary from those that are winter wet seasonal ponds in woodland and in fields to large permanent ponds with a good diversity of species. Several of the ponds in the Binsted Wood Complex are heavily shaded and lack wetland vegetation, although there are ponds within the woodland that hold water all year and support aquatic, emergent and water margin vegetation.
- 3.50 A number of ponds are around Binsted Village and Tortington Village in gardens. Others are in wet woodland or adjacent to woodland. A winter-wet field pond is to the east of Tortington Rife and many of the woodland ponds appear to be ephemeral in nature.
- 3.51 Only the ponds to the west of the survey area around Binsted could be accessed for survey. A good range of aquatic and water-margin species are present including the Nationally Scarce and Sussex Scarce Water Soldier (Sandy Hole Pond), and the less common Bogbean *Menyanthes trifoliata* (Madonna Pond).
- 3.52 Other aquatic vegetation includes less common duckweeds such as Greater Duckweed *Spirodela polyrhiza* and Ivy-leaved Duckweed *Lemna trisulca*. Emergent / water margin species include Lesser Bulrush *Typha angustifolia*, Cyperus Sedge *Carex pseudocyperus* and Water-plantain *Alisma plantago-aquatica*.
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Lowland fen and swamp

- 3.53 Binsted Rife has a wide range of National Vegetation Classification communities. It is a mosaic of rush pasture, damp grassland, swamp and lowland fen communities where the ground is permanently or seasonally very wet. The northern end of the rife is extremely diverse with the main community, MG10 *Holcus lanatus*-*Juncus effusus* rush-pasture, interrupted by mosaics of various communities such as S5 *Glyceria maxima* community, S6 *Carex riparia* swamp, S7 *Carex acutiformis* swamp and S14 *Sparganium erectum* swamp, all forming mostly single-species stands. These communities sometimes fringe the rife itself, though the main community along the watercourse is S4 *Phragmites australis* swamp and reedbeds.
- 3.54 Intermixed with this there are some more diverse areas that are more accurately described as lowland fen, with communities such as S26d *Phragmites australis-Urtica dioica* tall-herb fen, *Epilobium hirsutum* sub-community and S28b *Phalaris arundinacea* tall-herb fen, *Epilobium hirsutum-Urtica dioica* sub-community. These communities are extremely diverse with a good range of associates such as Lesser Water-parsnip *Berula erecta*, Ragged-robin *Silene flos-cuculi*, Bog Stitchwort *Stellaria alsine*, Cuckooflower *Cardamine pratensis*, Celery-leaved Buttercup, Wild Angelica, False Fox-sedge *Carex otrubae*, Water Forget-me-not *Myosotis scorpioides* and Plicate Sweet-grass *Glyceria notata*.
- 3.55 This vegetation grades into short grassland on higher ground up the banks, with some small areas of relatively species-rich rabbit-grazed grassland of the NVC type MG6 *Lolium perenne*-*Cynosurus cristatus* grassland.
- 3.56 At the southern end of the rife, the robust swamp vegetation gives way to a shorter sward and the rush grassland becomes less dominant. Here the main communities are MG7d *Lolium perenne* – *Alopecurus pratensis* grassland, MG13 *Agrostis stolonifera*-*Alopecurus geniculatus* grassland, S19 *Eleocharis palustris* swamp and S22 *Glyceria fluitans* water-margin vegetation.
- 3.57 Whorl-grass, listed on the SxRSI, was found in the muddy margins of two ditches and the Nationally Scarce aquatic Frogbit *Hydrocharis morsus-ranae* was found within the rife. Fen Bedstraw *Galium uliginosum*, also listed on the SxRSI, was growing amongst the wetland vegetation.
- 3.58 A marshy field to the west of Tortington Rife supports a good diversity of flowering plants intermixed with areas of reedbed of the NVC types S4 *Phragmites australis* swamp and reedbeds and S7 *Carex acutiformis* swamp. The fields to the south of this lack the diversity but are very wet with areas of swampy vegetation variously dominated by *Carex nigra* Common Sedge and *Carex disticha* Brown Sedge.

Reedbed

- 3.59 Linear areas of reedbed are throughout the Mid Arun Valley along ditches, which, on occasion extend into fields, such as reedbed found in the marshy field to the west of Tortington Rife, fields around the reservoirs and pockets of reedbed along the Arun.
- 3.60 A particularly large area of reedbed is on the east side of the Arun. This is fringed with salt-marsh vegetation dominated by Sea-purslane *Atriplex portulacoides* adjacent to the river.
-

- 3.61 The reservoirs to the south of Binsted Rife are fringed with a wide margin of reedbed vegetation of the NVC type S4 *Phragmites australis* swamp and reedbeds. Other wetland associates include Great Willowherb, Hemlock Water-dropwort, Common Fleabane *Pulicaria dysenterica* and Hard Rush *Juncus inflexus*.
- 3.62 This vegetation grades into tall, species-rich grassland of the NVC type MG1e *Arrhenatherum elatius* grassland, *Centaurea nigra* sub-community and stands of tall herbaceous species and ruderals. Species indicative of more base-rich conditions, possibly due to the chalk origin of the water, include Southern Marsh-orchid *Dactylorhiza praetermissa*, Weld *Reseda luteola* and Wild Parsnip *Pastinaca sativa*.

Coastal and floodplain grazing marsh

- 3.63 The floodplain grazing marsh extends along the Arun with smaller areas along Binsted Rife where it forms a mosaic, in part, with the lowland fen, swamp and reedbed habitat. It also extends along Tortington Rife.
- 3.64 The grazing marsh has not been surveyed to the east of the Ford Road where it surrounds the River Arun and is dissected by drainage ditches. It is often the case in such habitats that the drainage ditches hold the main botanical interest.

River corridor

- 3.65 The margins of the River Arun support species of brackish conditions including frequent Sea Aster *Aster tripolium*, Sea Beet *Beta vulgaris* subsp. *maritima* and Sea-purslane *Atriplex portulacoides*. Other species found on an occasional basis include Sea Plantain *Plantago maritima* and Sea Arrowgrass *Triglochin maritima* and the Nationally Scarce Marsh-mallow *Althaea officinalis*.
- 3.66 Much of the upper margin and flood defence bank is dominated by rough vegetation, largely composed of typical species of coarse coastal grassland, such as Wild Carrot *Daucus carota*, Bristly Oxtongue *Helminthotheca echioides*, Mugwort *Artemisia vulgaris* and Common Fleabane. Less common species include Corn Parsley *Petroselinum segetum*. Grasses include False Oat-grass *Arrhenatherum elatius*, Sea Couch *Elytrigia atherica* and Meadow Barley *Hordeum secalinum* with scattered stands of Common Reed *Phragmites australis*.
- 3.67 The path along the west side of the bank has a varied and colourful grassland flora, which includes locally frequent Common Broomrape *Orobancha minor*. Occasional patches of damp mud support plants of brackish habitats such as Divided Sedge *Carex divisa* (NS, SxRSI, S41 Species of Principal Importance), Saltmarsh Rush *Juncus gerardii*, Reflexed Saltmarsh-grass *Puccinellia distans*, Common Saltmarsh-grass *Puccinellia maritima*, sea-spurreys *Spergularia* spp., and Hard-grass *Parapholis strigosa*.

PLANTS AND FUNGI

Fungi

- 3.68 Twenty-three fungal species have been recorded in the Mid Arun Valley with numerous records that cannot be assigned to species with a rigorous level of confidence.
- 3.69 Within this list the Zoned Rosette *Podoscypha multizonata* is a Section 41 Species of Principal Importance and also listed on the Sussex Rare Species Inventory (SxRSI), found in Binsted Park and the Violet Webcap *Cortinarius violaceus* (SxRSI) was found in Tortington Common.
- 3.70 The woodlands and shaws are considered to have the potential to support an important assemblage of fungi.

Notable plant species

- 3.71 The following notable species, listed in Table 2, have been found in the Mid Arun Valley. They are all on the Sussex Rare Species Inventory and two are Red Data Book species.

Table 2: Notable plant species found in the Binsted area in 2015-2017

Common Name	Latin Name	Location	Status	SxRSI
Blunt-flowered Rush	<i>Juncus subnodulosus</i>	Binsted Rife		
Box	<i>Buxus sempervirens</i>	Binsted Wood	NR	
Cornflower	<i>Centaurea cyanus</i>	Arable field		
Divided Sedge	<i>Carex divisia</i>	Banks of Arun	NS / S41	
Fen Bedstraw	<i>Galium uliginosum</i>	Binsted Rife		
Fritillary	<i>Fritillaria meleagris</i>	Binsted Park	NS/RDB VU	
Frogbit	<i>Hydrocharis morsus-ranae</i>	Binsted & Tortington	RDB VU	
Ivy-leaved Crowfoot	<i>Ranunculus hederaceus</i>	Binsted Rife		
Marsh-mallow	<i>Althaea officinalis</i>	Banks of Arun	NS ²	
Narrow-leaved	<i>Lathyrus sylvestris</i>	Binsted		
Royal Fern	<i>Osmunda regalis</i>	Binsted		
Water-soldier	<i>Stratiotes aloides</i>	Sandy hole pond	NR	
Whorl Grass	<i>Catabrosa aquatica</i>	Binsted Rife		

- 3.72 In addition the following noteworthy local and / or uncommon species species have been recorded in the area:

- Orpine *Sedum telephium* – Several patches in Binsted Woods – it is an uncommon ancient woodland indicator, though no longer classified as Nationally Scarce as it was in 1992.
- Southern Wood-rush *Luzula forsteri* - found in Binsted Woods and near the east end of Muddy Lane is a less common species only occurring in the south.
- *Luzula forsteri* x *pilosa* = *L. x borrieri*. This is a local species and was recorded at Tortington Common.
- Bogbean *Menyanthes trifoliata*. This species has decreased in south-east England because of the drainage of wetlands in both historic and recent times. It grows in the Madonna Pond.

- Thin-spiked Sedge *Carex strigosa* – found in Steward’s Copse. There has been a noteworthy decline of this species in Sussex and Kent.
- Adder’s-tongue *Ophioglossum vulgatum*. This rhizomatous, deciduous fern was found growing abundantly in a damp field by Tortington Rife. It is found on mildly acidic to base-rich soils in open woodland, meadows and damp pastures but has been lost from many lowland sites due to intensification of agriculture and land drainage.

Non-native invasive species

3.73 The following non-native invasive species were recorded in the area.

- Rhododendron *Rhododendron ponticum* found growing in the Binsted Wood Complex in several areas.
- Cherry Laurel *Prunus laurocerasus* recorded growing near the Madonna Pond and in Hundred House Copse.

3.74 Rhododendron, is listed on Schedule 9 of the Wildlife and Countryside Act 1981. As such, it is illegal to plant or otherwise knowingly cause these species to grow in the wild or spread to adjacent land owned by others.

3.75 Cherry Laurel is listed as an invasive species in Sussex. Its growth form and impact on wildlife is very similar to that of Rhododendron, forming dense thickets and excluding all other species from woodlands.

PROTECTED SPECIES

Badger

3.76 Badger *Meles meles* activity is extremely high in the area with numerous records of excavation, foraging signs, latrines and Badger crossing roads.

3.77 Active setts have been confirmed in the Barns Copse, The Shaw, along Binsted Rife and Fowlers Copse. Smaller setts, possibly outliers, have been recorded in a garden in Binsted and near Tortington Rife.

Bats

3.78 Bat trapping and tagging surveys have been carried out in the last two years by AEW (Whitby 2016, 2017) within the Binsted Woods Complex. These surveys have confirmed presence of the following species:

- Barbastelle *Barbastella barbastellus*
- Serotine *Eptesicus serotinus*
- Alcathe bat *Myotis alcathe*
- Bechstein’s bat *Myotis bechsteinii*
- Brandt’s bat *Myotis brandtii*
- Daubenton’s bat *Myotis daubentonii*

- Natterer's bat *Myotis nattereri*
- Whiskered bat *Myotis mystacinus*
- Noctule bat *Nyctalus noctula*
- Common Pipistrelle *Pipistrellus pipistrellus*
- Nathusius's Pipistrelle *Pipistrellus nathusii*
- Soprano Pipistrelle *Pipistrellus pygmaeus*
- Brown Long-eared bat *Plecotus auritus*

- 3.79 This list includes Bechstein's bat and Barbastelles, which are Annex II species. Eight species of bat may have maternity colonies within the Binsted Woods Complex as pregnant females were found.
- 3.80 A Bechstein's maternity colony is located in the southern part of Torrington common with a count of 26 bats emerging during a survey in 2016. Two additional roost sites for this species were found in Steward's Copse.
- 3.81 Locally breeding female Alcahoes were caught in 2016 and roosts identified through tagging one individual. In 2016 / 2017 roosts were found in Torrington Common and Binsted Woods.
- 3.82 A new maternity colony of Serotine bats has been confirmed in Barnham to the south west of the Binsted area using several buildings for roost sites. During the surveys a number of Serotine bats were observed commuting from the west following hedgerows and woodland edges indicating that these bats are likely foraging in the Binsted Woods Complex.

Birds

- 3.83 A total of 84 species of birds have been recorded within the Mid Arun Valley of which 16 are Birds of Conservation Concern (BoCC) Red-listed species and 20 are Amber-listed species. A total of 15 of the birds recorded have Biodiversity Action Plans and 6 are also Schedule 1 species.
- 3.84 Many of the less common species have had numerous sightings such as Mistle Thrush *Turdus viscivorus* (Red List), Song Thrush *Turdus philomelos* (Red List), Linnet *Carduelis cannabina* (Red List), Nightingale *Luscinia megarhynchos* (Red List), Yellowhammer *Emberiza citrinella* (Red List), Cuckoo *Cuculus canorus* (Red List), Grey Wagtail *Motacilla cinerea* (Red List) and Meadow Pipit *Anthus pratensis* (Amber List).

Dormouse

- 3.85 Paines Wood, Ash Piece and recently Noor Wood (Torrington Common), are part of the National Dormice Monitoring Programme (NDMP). Good (though fluctuating) populations of Dormice *Muscardinus avellanarius* have been recorded consistently at Paines Wood and Ash Piece for fifteen years. Dormice and their nests are now routinely recorded at Noor Wood, within which nest boxes were erected when it was added to the programme in 2015.
- 3.86 In 2016 Lake Copse and The Shaw were added to the National Dormouse Monitoring Programme and Dormouse nests have already been found in both arms of woodland, as was expected, due to the ideal habitat.
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3.87 In 2017 Manor House and Meadow Lodge were added to the National Dormouse Monitoring Programme. A confirmed Dormouse nest has been recorded at Meadow Lodge.

Great Crested Newt

3.88 Smooth Newt *Lissotriton vulgaris* and Palmate Newt *Lissotriton helveticus* have both been recorded in high numbers throughout the area.

3.89 Great Crested Newts *Triturus cristatus* have not been found in the ponds that have been explored around Binsted Village, though no targeted surveys have been undertaken. However, there is much suitable habitat in the area such as Binsted Rife, Tortington Rife and ponds around Tortington.

Reptiles

3.90 All four species of 'common' reptiles have been recorded in the Mid Arun Valley in the last two years. These species have all declined dramatically and are therefore given protection wherever they occur.

3.91 There have been no targeted surveys for reptiles and the following are 'ad hoc' sightings from ecologists and residents.

- Common Lizard *Zootoca vivipara* – this species is widespread in the area with many sightings in the last two years basking along field edges, in rough grassland, in gardens on logs.
- Slow Worm *Anguis fragilis* – this species has been seen around Binsted and in woodland clearings around Tortington Common.
- Grass Snake *Natrix natrix* – there have been many sightings of Grass Snake throughout the area such as damp rough grassland to the north of the railway line, basking along the edge of Tortington Lane, in woodland clearings in Tortington Common, The Shaw, The Lag and Binsted Rife.
- Adder *Vipera berus* – has been seen in Binsted at the edge of the nursery and basking in the garden at the southern end of The Shaw. This species also occupies the mosaic of wet and dry habitat in the Binsted Woods Complex around Tortington Common.

UKBAP priority species / SPI – Brown Hare

3.92 The European Brown Hare *Lepus europaeus* was recorded near Lake Copse in 2016 and has also been recorded in Ford.

3.93 In 2017 there have been three recordings in and around Binsted, one of which was a dead Hare killed by a car on Binsted Lane.

UKBAP priority species / SPI – Common Toad

3.94 Common Toad *Bufo bufo* is widespread throughout the area with sightings throughout the Mid Arun Valley. Ponds and ditches are throughout the Binsted and Tortington area and it is possible that many more than could be surveyed may support Common Toad.

3.95 An estimated one thousand plus Common Toads were seen breeding in Madonna Pond in March 2017. Strings of toad spawn were found during a survey (March 2017) in a garden pond at the southern end of The Shaw and tadpoles were found in a garden pond at the southern end of Lake Copse, The Shaw and The Lag.

3.96 The latter pond is in close proximity to Tortington Rife where thousands of Common Toad tadpoles were recorded in the spring of 2016.

UKBAP priority species / SPI European Eel

3.97 The European Eel *Anguilla anguilla* has been recorded in Lake Copse at Binsted and the Black Ditch at Lyminster (Thompson 2016).

UKBAP priority species / SPI – European Hedgehog

3.98 Field signs for European Hedgehog *Erinaceus europaeus* have been recorded for a 300 m stretch along Muddy Lane in the north part of Binsted. There is also a separate sighting for Hedgehog along Muddy Lane.

3.99 Hedgehog faeces have been recorded in Noor Wood which is in Tortington Common.

UKBAP priority species / SPI – Harvest Mouse

3.100 A survey in one of the suitable locations for Harvest Mouse *Micromys minutus*, a field to the west of Tortington Rife, was undertaken in 2016 by Sam Buckland, Lucy Groves and Ian Powell in October 2016. A total of eleven nests were found throughout the field.

Water Vole

3.101 In 2015 spot checks were carried out for Water Vole *Arvicola amphibius* feeding remains and latrines. Feeding remains and latrines were found along Binsted Rife at SU 9839 0453 and at the reservoirs to the south of Binsted Rife at SU 98698 04497. Additionally, potential burrows were observed on an island in the larger reservoir (SU 98740 04490). Possible Water Vole footprints were observed at Lake Copse (SU 98828 05782) and the distinctive sound of a Water Vole dropping into water was heard.

Invertebrates - butterflies

3.102 A total of 179 records for butterflies have been submitted within the last 2 years which does not include any of the targeted invertebrate surveys that have been undertaken.

3.103 This amounts to 28 species which include the Purple Emperor *Apatura iris* (IUCN Red List – Near Threatened), Dingy Skipper *Erynnis tages* and White Admiral *Limenitis camilla* which are both Section 41 Species of Principal Importance under the NERC Act (2006).

Invertebrates – beetles

3.104 A beetle survey was conducted at Lake Copse, and two nearby field hedges in May to October (Grove 2016).

3.105 The survey found 230 beetle species, including one Red Data Book species and 10 Nationally Scarce species. Moreover, each location also produced a beetle not previously recorded in Sussex.

3.106 Dr. Grove is familiar with the area having previously recorded beetles in the Binsted Woods Complex (2006) where 400 species from 46 different families including 25 Nationally Notable species and 2 Red Data Book species were found.

Invertebrates - general

3.107 In 2016 / 2017 Mike Edwards led an invertebrate survey sampling a number of invertebrate groups in Little Danes Wood, Binsted Rife, the western edges of the Binsted Woods Complex, and an area in Binsted Village.

3.108 A total of 551 species were recorded which includes 29 Nationally Scarce species, 3 Section 41 species (NERC 2006) and 6 Red Data Book Species such as *Dorycera graminum*, *Andrena bucephala*, *Limnophila pictipennis* and *Limonia masoni*.

3.109 In just two hours of collecting (22.08.15), a local entomologist, Nathalie Guerin, found 130 invertebrate species along the edge of Binsted Rife including approximately 29 hoverflies, 29 bugs, 18 beetles and a variety of other groups such as gall flies, bumblebees and bush crickets. It also included a Section 41 Species of Principal Importance, two Nationally Notable hoverflies *Volucella inanis* and *Volucella zonaria* and a Nationally Scarce Beetle *Anthocomus fasciatus*.

3.110 In a half-day sampling session (17.06.17) in Noor Wood Tortington Common, Nathalie Guerin found 87 species including hoverflies, moths, weevils, shieldbugs, flies and beetles. Many species were associated with Oaks and one Nationally Notable species, *Ampedus elongantulus*, a click beetle, was found together with a Nationally Scarce moth species and two Local species.

Invertebrates - aquatic

3.111 During a three-minute standard net in water freshwater sampling survey undertaken in Binsted Rife (07.07.16 Bill Young) seventeen genera were found. Simpson's Diversity Index was used to measure the diversity of the rife. This method of measuring species richness takes evenness as well as diversity into account and gave an index of 8 indicating that Binsted Rife supports a diverse assemblage of aquatic invertebrates.

Invertebrates - moths

3.112 Two moth-trapping exercises were carried out in 2016. A survey at Lake Copse at SU 990 057 (29.07.16) found 47 moth species including one Section 41 Species of Principal Importance, the Yellow-tail *Euproctis similis*.

3.113 An additional survey relatively nearby at SU 986 065, along the hedgerow bounding the south of Scotland field (06.08.16), found 40 moth species. This included 6 Section 41 Species of Principal Importance including Ghost Moth *Hepialus humuli* and Rosy Rustic *Hydraecia micacea* and 4 with Local status such as Rosy Footman *Mitochrista miniata*.

Invertebrates - Odonata

- 3.114 Twelve species of dragonfly and damselfly have been recorded in the Mid Arun Valley. This includes the Azure Damselfly *Coenagrion puella*, the Broad-bodied Chaser *Libellula depressa* the Brown Hawker *Aeshna grandis*, the Southern Hawker *Aeshna cyanea* and the less common White-legged Damselfly *Platycnemis pennipes*.

Invertebrates - miscellaneous

- 3.115 The Stag Beetle *Lucanus cervus*, a Section 41 Species of Principal Importance due to significant National (and European) declines, was recorded in Binsted Woods in 2015. This species also requires wood that is the texture of balsa, but at ground level.
- 3.116 The Glow-worm, *Lampyrus noctiluca*, is another iconic beetle in the area. This is frequently seen along Old Scotland Lane and is observed yearly in a garden in Binsted at the southern end of The Shaw. Although this species is not listed as rare, it is not common.

4 EVALUATION

HABITATS

4.1 The Mid Arun valley comprises a rich mosaic of habitats, many of which are Section 41 Habitats of Principal Importance for the conservation of biodiversity. The habitats that will be directly impacted upon by any of the route Options are considered below.

Ancient semi-natural woodland

4.2 This is a large block of extremely diverse woodland, which constitutes three S41 Habitats of Principal Importance – *lowland deciduous woodland*, *wet woodland* and *lowland heath*. (The latter will not be impacted by the route Options).

4.3 The Binsted Woods Complex is a complex of woodland sites and is the largest area of woodland to the south of the A27 along the Sussex coastal plain. It is the size of this woodland that enables it to support such a diverse and viable range of protected species, many of which rely on the surrounding habitats as well in order to survive.

4.4 A 1992 assessment by the Environmental Advisory Unit Ltd. noted that over 250 plant species had been found in the past, with the wooded areas holding between 150 and 170 plant species. This was put to the test in 2015 by recorders from the Sussex Botanical Recording Society who found a total of 261 native species, which includes 53 Ancient Woodland Indicator species (past surveys have found 52).

4.5 The woodland has a high number of mature, notable and veteran trees and a high number of areas within the Binsted woodland complex hold Tree Protection Orders (TPO's) including a block in Little Danes Wood, one at Brickkiln Piece and a number of areas around Steward's Copse.

Woodland and ancient shaws

4.6 These areas of woodland are classified as S41 Habitats of Principal Importance *lowland deciduous woodland* and *wet woodland*.

4.7 They provide important reservoirs of ancient woodland species and this enables colonisation of such species in the younger blocks of plantation woodland. They serve as habitat linkages / green corridors and provide nesting habitat for farmland birds and Dormice. In 2016 three Nightingales were heard singing in one such area of woodland at SU 9976 0587.

Hedgerows

4.8 All the hedgerows in the area comprise native woody species and, as such, classify as S41 Habitats of Principal Importance.

4.9 The range of hedgerow structure is from trimmed and dense to tall and overgrown with dense stands of Bramble. This provides excellent habitat for a range of farmland birds in the area such

as Linnet, Tree Sparrow *Passer montanus*, Yellowhammer and Turtle Dove *Streptopelia turtur* all of which are Red List species.

4.10 Many have ancient woodland indicator species such as Butchers Broom and Primrose. Standard trees are frequent in the hedgerows and many of these are classed as veteran or notable with features of considerable value to wildlife.

4.11 The hedgerows provide extremely important corridors radiating out from the Binsted Woods Complex and across the landscape.

Notable / veteran trees

4.12 Notable and veteran trees are classified as S41 Habitats of Principal Importance within the category *wood pasture and parkland*.

4.13 They are important for the features that they display with progressive aging, providing habitat for many organisms, known as 'veteran features'. The tree is progressively colonised by fungi that change the nature and condition of the wood resulting in an accumulation of dead woody tissue. This often results in the shedding of branches which in turn may result in branch cavities, shattered branch ends, loose bark, sap runs, a range of rot types and eventually the hollowing of the tree. The fruiting bodies and mycelia of saproxylic fungi may in turn be colonised by specialised invertebrates.

4.14 As the tree ages the number of specialist niches increases, each with a diverse food web. Due to the decrease in the number of such trees and the clearing and tidying of dead wood, many of these species are very rare. Such saproxylic invertebrates have limited powers of dispersal, and so the greater the length of time a group of trees have persisted in an area, the greater the chance that this habitat has been colonised by such species.

4.15 Another group to make use of these trees is the bats. Many species roost under bark, in crevices and in hollows. Such trees may also be used for maternity roosts and hibernation. The high numbers of tree-roosting bats in the Mid Arun Valley, is, in part, attributable to the abundance of these trees.

Arable field margins

4.16 The more species rich arable field margins would be classified as a S41 Habitat of Principal Importance.

4.17 All arable field margins provide a transition from bare ground to dense vegetation supporting a range of flowering plants and grasses and collectively covering a significant area. This, in turn provides a food source and cover for a diversity of vertebrates and invertebrates.

4.18 Arable field margins are life-lines and corridors that allow mammals, reptiles and amphibians to move across the landscape.

Chalk streams

4.19 Chalk streams classify as S41 Habitats of Principal Importance within the category *aquifer-fed naturally fluctuating water bodies*.

4.20 Binsted Rife is fed from drainage of the South Downs and is surrounded by a mosaic of lowland fen, swamp and wetland vegetation. It is one of the most diverse and unusual habitats in the area and a remnant of wetland habitat that is becoming scarce in the county.

4.21 A second chalk stream originates at Sandy Hole Pond and traverses the landscape above and below ground along field edges and into the Lake Copse woodland. Although calcareous in origin, this influence is mostly lost along its course.

Drainage ditches and streams

4.22 The streams and ditches vary widely in nature and therefore have the potential to support a wide range of species (both plant and animal) across the landscape.

4.23 The streams traversing areas of woodland alter the local environment, sometimes with wet marshy areas and braiding. This is reflected in a more diverse ground flora and humid conditions ultimately resulting in localised increases in biodiversity.

4.24 The streams and ditches provide riparian corridors through the landscape, allowing ease of movement for species such as Water Vole, European Eel and potentially Otter.

Ponds

4.25 A number of ponds, particularly those that are species rich, of ancient origin or support protected species, would be classified as S41 Habitats of Principal Importance.

4.26 Ponds, both ephemeral and permanent, throughout the area collectively support a high number of plant species. Sandy Hole Pond and ephemeral pools within Hundred House Copse and Little Danes Wood are unusual being calcareous; fed from chalk springs / seepages.

4.27 Several of the ponds are marked on the 1880 Ordnance Survey map (Sheet LXII) and, as such, have provided a continuous habitat for well over one hundred years enabling them to be used by generations of species. Examples are that they are now important breeding sites for Common Toad, watering holes for Badgers and foraging areas for bats.

4.28 Ponds are generally known to accumulate more species with age, and because individual ponds vary significantly in their species composition, overall they often contribute more to local biodiversity than rivers or other habitats.

Lowland fen and swamp

4.29 Lowland fen and swamp communities are S41 Habitats of Principal Importance under *lowland fen*.

4.30 They have declined in extent due to land drainage schemes. However, there are pockets of good quality habitat in the area, particularly along Binsted Rife and to the west of Tortington Rife.

4.31 This habitat is uncommon in Sussex, particularly with an assemblage of associated rare plants intermixed with those of calcareous origin which would elevate Binsted Rife to be of County significance.

Reedbed

- 4.32 Reedbed is a S41 Habitat of Principal Importance. The most notable area is to the east of the Arun, and is considered to be noteworthy due to its large size.
- 4.33 The ribbons of reedbed along the ditch network link this habitat providing cover and habitat for a range of protected species.

Coastal and floodplain grazing marsh

- 4.34 This is a S41 Habitat of Principal Importance and forms part of a contiguous corridor of open habitat along the River Arun from the middle of Sussex right down to the coast through the Climping Gap.
- 4.35 This, when compared to other mid-Sussex rivers such as the Adur and the Ouse is largely uninterrupted by urban areas and major road networks.

River corridor

- 4.36 The river corridor is a S41 Habitat of Principal Importance and supports a number of rare plant species.
- 4.37 The banks along this stretch of the Arun have mostly been artificially enforced, though there are scattered communities of interest such as a sizable area of reedbed on the east side, smaller areas of reedbed along its length and small areas of saltmarsh vegetation.

Other habitats

- 4.38 Additional S41 habitats such as saltmarsh and lowland heath are in small fragments in the area or will not likely be significantly negatively impacted by any of the Options.
- 4.39 Habitats such as ruderals and scrub, pockets of grassland and scattered trees are throughout the area, as they are the general countryside. They are immensely important to protected species forming protective cover, habitat for breeding birds, corridors and refuges in a farmed landscape. These habitats are however readily replaceable, though the numerous corridors they provide are not.

Important habitats

- 4.40 The Binsted Woods Complex, due to its diversity of woodland types as well as plants, fungi, bryophytes and invertebrates, together with a high number of protected species, is considered to be of National Importance.
- 4.41 The calcareous streams, springs and seepages and associated features such as Alder carr and lowland fen, resulting from the unique geology, are considered to be of County Importance.

PROTECTED SPECIES

Badger

- 4.42 Badgers are protected under the Protection of Badgers Act (1992); the Wildlife and Countryside Act of 1981 (and as amended). As such it is an offence to willfully take, kill, injure a Badger. Under the Protection of Badgers Act (1992), their setts are also protected against obstruction, destruction, or damage in any part, and the animals within a sett cannot be disturbed.
- 4.43 The Badger population is extremely high in the area due to a good range of habitat types. Higher and drier land, optimal for sett building is juxtaposed with low lying damp grassland and arable fields throughout the area offering excellent foraging opportunities.
- 4.44 Badger sett-building activity has been observed in quite open habitat on narrow sloping pasture in the Binsted Rife valley which may be due to a very high population density and / or a lack of disturbance in the area.

Bats

- 4.45 All species of bat present in the UK receive full protection under The Conservation of Habitats and Species Regulations 2010, and the Wildlife and Countryside Act 1981 (as amended).
- 4.46 A number of bat species, Barbastelles, Bechsteins's bats, Noctule, Soprano Pipistrelle, Brown Long-eared bat are UKBAP priority species that have been adopted as Species of Principal Importance in England under Section 41 of the NERC Act (2006).
- 4.47 The four rarest British bat species are listed in Annex II of the Habitats Directive (adopted in 1992). For species listed in Annex II of the Habitats Directive, core areas of their habitat must be protected under the Natura 2000 Network and the sites managed in accordance with the ecological requirements of the species.
- 4.48 The local area is known to be important for bats for extensive surveys have been conducted at Slindon National Trust estate over a number of years to identify the species present and study the Barbastelle colony discovered there.
- 4.49 Thirteen bat species amounts to fractionally below three quarters of the entire British species, but given the landscape, habitats and small amount of survey effort, more species may be present. Bats will roost in a variety of habitats such as mature trees, buildings and bridges.
- 4.50 The presence of two Annex II bat species within the Binsted Woods complex, one of which, Bechstein's bat, with a confirmed maternity roost in Tortington Common, gives the area potentially qualifying criteria for a Special Area of Conservation (SAC) and possibly Nationally Important status particularly if a Barbastelle maternity colony is found or additional bat species.
- 4.51 The surveys have demonstrated that the area is littered with trees with features suitable for roosting bats such as hollowing, splits, cracks, woodpecker holes and rot holes. The full extent of these trees present in the Binsted Wood Complex and throughout the landscape has only just been touched upon and certainly not recorded.

- 4.52 The landscape provides an ideal dark area for foraging. Open spaces within the Binsted Wood Complex such as the wayleave, Old Scotland Lane and small clearings in Tortington Common as well as the woodland edge, woodland extensions such as Lake Copse, The Lag and The Shaw and the shaws extending from the woodland to the south of Tortington Common, provide ideal sheltered foraging habitat in areas of still air.
- 4.53 The low-lying floodplain landscape with the river, water bodies, wet ditches and damp fields surrounded and sheltered by hedgerows and tree-lines attracts insects such as midges, moths and micro-moths. This abundant habitat is readily accessible, for the numerous hedgerows, scrub-lines and tree-lines provide flight-lines and protective cover whilst foraging.
- 4.54 This landscape provides a variety of roost sites and foraging areas relatively close together and a dense commuting network with no barriers to dispersal. This combination of factors means that there are likely to be lower metabolic demands on commuting bats and lower predation, which would result in increased breeding success and therefore stable populations – hence the good diversity of bat species.
- 4.55 These initial baseline surveys clearly show that this is an important area for bats, with two Annex II species present and several other rare or threatened species including the recently discovered Alcathe bat. Bats can be used as indicators of biodiversity and show that this is an ecologically important area.
- 4.56 The Mid Arun Valley including the Binsted Woods Complex, smaller copses, shaws, farmland, fen, wetland and traditional old buildings covers a large area, which requires a thorough and complete set of bat surveys across all habitats and different areas throughout the year to build up a picture of bat species using the site.

Birds

- 4.57 Breeding birds are protected by the Wildlife and Countryside Act 1981 (as amended). Under this legislation, it is an offence to intentionally kill, injure or take the birds or their eggs, or to intentionally destroy or disturb a nest, when it is in use or being built.
- 4.58 Many bird species are listed as being UKBAP priority species and have subsequently been adopted as Species of Principal Importance (SPI) for the conservation of biodiversity in England, in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. A proportion of UK birds are Birds of Conservation Concern, Red List or Amber List species.
- 4.59 A high number of birds have been recorded within the last two years and the area, as a whole, is known to have an extremely high diversity of birds with just under a third of the British total in a relatively small area of the Mid Arun Valley (Thompson 2016). There are a number of reasons for this high species diversity as follows:
- The diversity of habitats of which many are either Section 41 Habitats and / or in environmental stewardship schemes. This has resulted in a good mix of farmland, wetland and woodland species with a good representation of birds of prey such as Buzzard *Buteo buteo*, Barn Owl *Tyto alba* (Schedule 1) and Tawny Owl *Strix aluco* (Amber List).

- The damp fields and network of ditches provide aerial forage for summer visitors such as Swallows *Hirundo rustica*, Swifts *Apus apus* (Amber List) and House Martins *Delichon urbica* (Amber List). Undisturbed buildings, barns and stables provide nesting opportunities.
- The farmland supports large numbers of winter visitors such as Redwings *Turdus iliacus* and Fieldfares *Turdus pilaris* and declining species such as Linnet and Yellowhammer (all Red List species).
- The river Arun provides hunting corridors for the Hobby *Falco subbuteo* and nesting opportunities for Kingfishers *Alcedo atthis* (Amber List), which are both Schedule 1 species.
- Undisturbed, scrubby woodland above dense and tall vegetation is ideal for Nightingales (Red List).
- The vast area of floodplain grassland is of importance to a wide range of wetland species; many of which have declined substantially and therefore have various layers of protection.
- The juxtaposition to the Arun Valley SNCI, which comprises extensive wetlands, supporting breeding wintering birds, waders and wildfowl such as Snipe *Gallinago gallinago* (Amber List) and Lapwing *Vanellus vanellus* (Red List and Schedule 1), which also breed in the Mid Arun Valley area.
- The proximity of the Arundel Wetlands Centre which provides a haven for a high number of passage waders and the landscape linkage from the coast through the Mid Arun Valley area and along the Arun into mid Sussex to areas of the Arun Valley such as Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks. These form the Arun Valley Special Protection Area for rare and threatened birds (SPA).
- A high number of species recorded in the SPA have been recorded in the Mid Arun Valley (Thompson 2016), and this uninterrupted corridor may contribute to the high numbers of birds in the area and may be of importance to the bird populations.
- The extensive reedbeds of the Arundel Wildfowl and Wetlands Trust reserve and along the River Arun and ditches extending into the Mid Arun Valley are a major stronghold of breeding Reed Warblers *Acrocephalus scirpaceus* in west Sussex (recorded repeatedly in the Mid Arun Valley). This is an important species for the Cuckoo (Red List), which is frequently heard in the spring and a brood parasite of this species.

4.60 The British Trust for Ornithology (BTO) has conducted annual bird surveys on the same square kilometer at Marsh Farm for approximately twenty-five years (1989 – 2013). While farmland birds underwent massive declines in the wider countryside, the number of birds and species of birds recorded at Marsh Farm stayed constant with sixty-four species recorded during the first year and sixty-three during the last.

4.61 It is considered that the integrated landscape offers ideal breeding and foraging opportunities for a great range of birds of different habitats.

Dormouse

4.62 Dormice receive full protection under The Conservation of Habitats and Species Regulations 2010, and the Wildlife and Countryside Act 1981 (as amended). Dormouse is a UKBAP priority

species and has been adopted as a Species of Principal Importance in England under Section 41 of the NERC Act (2006). The UK holds 25% of world population of Dormice.

- 4.63 The landscape lends itself to a strong Dormouse population due to the large and uninterrupted block of woodland with a varied canopy and dense shrub layer in places. During an initial scoping survey in 2015 it was thought that the landscape is ideal for dispersal with arms of woodland and shaws extending from the main woodland of the Binsted Woods Complex, which are linked to the wider landscape by outgrown and undermanaged hedgerows and tree-lines. Pockets of woodland litter the landscape and all have a variety of species providing a varied food source that would be able to support viable populations of Dormouse.
- 4.64 Dormouse monitoring was therefore extended through some of these areas and this initial assessment has proved to be correct with Dormice dispersing from the Binsted Woods Complex through The Lag and The Shaw. Dormice can also disperse through the linked canopy between the main block of the Binsted Woods Complex into Hundred House Copse to the west.
- 4.65 In 2015 / 2016 Brighton University undergraduate student James Burford undertook a project whereby the habitat suitability for Dormouse throughout the Binsted Woods Complex was calculated. The Complex was divided into similar parcels of woodland and a suite of habitat factors, based on the current literature and those associated with the most frequently occupied nest boxes in Ash Piece and Paines Wood since recording began (fifteen years ago).
- 4.66 Variables included scrub and canopy cover, dead wood availability, species diversity and connectivity. Based on the environmental parameters selected, all the other woodlands in the Binsted Woods Complex had higher Habitat Suitability Index (HSI) scores than Ash Piece and Paines Wood, with the exception of one area of pinewoods. From this and the results of the additional monitoring, it can be inferred that Dormice will be present throughout the Binsted Woods Complex.
- 4.67 Given the size of the woodland and the connectivity across the Mid Arun Valley landscape with Dormice proven to be dispersing, the Binsted Woods Complex may well be an important source population for the surrounding areas.

Great Crested Newt

- 4.68 Great Crested Newts are fully protected by both the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010. The species is a European Protected Species, a UKBAP priority species and has been adopted as a Species of Principal Importance in England under Section 41 of the NERC Act (2006).
- 4.69 The pond and ditch network provide ideal habitat for Great Crested Newt. Great Crested Newt (GCN) has been recorded 850 m from the area, and as there are presently no barriers to dispersal, there is the possibility that this species could be breeding in the Mid Arun Valley

Otter

- 4.70 Otters are classed as European Protected Species (EPS) under The Conservation of Habitats and Species Regulations 2010, and the Wildlife and Countryside Act 1981 (as amended). It is

therefore an offence to deliberately or recklessly kill, injure or disturb an Otter. It is an offence to obstruct access to or to destroy an Otter breeding site.

- 4.71 Otter is a UKBAP priority species and has been adopted as a Species of Principal Importance in England under Section 41 of the NERC Act (2006). Otter is also a Sussex BAP and listed on the SxRSI.
- 4.72 Eurasian Otter populations throughout Western Europe declined over the 20th Century due to bioaccumulation of pesticides. Since the introduction of legislation to ban / restrict such chemicals and to improve water quality this species is beginning to recover.
- 4.73 Otter is thought to be just beginning to extend its range across the Hampshire border into Sussex and there have been unconfirmed sightings in this catchment. There are undisturbed areas that are ideal for holt construction such as around Binsted Rife and areas of wet woodland.

Reptiles

- 4.74 Reptiles are protected under the Wildlife and Countryside Act of 1981 (and as amended), making it an offence to intentionally kill, injure, sell or advertise to sell any of the native species of reptile in the UK.
- 4.75 All reptiles are UKBAP priority species and have been adopted as Species of Principal Importance in England under Section 41 of the NERC Act (2006).
- 4.76 Four species of reptile are frequently seen in the area – Adder, Grass Snake, Slow Worm and Common Lizard. These species require the good diversity of habitat structure that the Mid Arun Valley landscape provides such as areas of lush grassland for hunting (and ditches and ponds for Grass Snake hunting), field edges, hedgerows and ditches for dispersal corridors, banks and arable field margins for basking and abundant mammal burrows and gaps beneath tree roots within hedgerows, shaws and woodland for hibernation.
- 4.77 Reptile populations are thought to be extremely high in the area as there are frequent sightings both in exceptionally good reptile habitat such as around Binsted and Tortington Rifes and Tortington Common and in other areas such as arable field margins, hedgebanks and other 'edge' habitats throughout the survey area.

Water Vole

- 4.78 Water Voles are protected under the Wildlife and Countryside Act of 1981 (and as amended), making it an offence to intentionally kill, injure any individual or recklessly damage, destroy or obstruct access to any structure or place which Water Voles use for shelter or protection or disturb Water Voles while they are using such a place
- 4.79 The Water Vole is a UKBAP priority species and has been adopted as a Species of Principal Importance in England under Section 41 of the NERC Act (2006).
- 4.80 The Mid Arun Valley area has an extensive interconnected ditch network with scattered ponds. Although some of the ditches are ephemeral in nature, many remain wet throughout the year offering suitable habitat. Moreover, there are ditches and ponds that are undisturbed by large

grazing animals in key areas of lush fringing and surrounding habitat such as along Binsted Rife, along Tortington Rife and ditches / reservoirs to the north of the railway line.

- 4.81 These areas offer a more complex habitat than just a linear network of ditches with breeding refuges for Water Voles where they are less likely to be predated upon by American Mink.

UKBAP priority species / SPI – Brown Hare

- 4.82 The European Brown Hare is a species of an open landscape where it occupies arable fields and pasture, both abundant in the Mid Arun Valley area. It is not usually seen unless disturbed for it is a nocturnal species spending most of the day in small depressions in the grass known as forms.

- 4.83 It has been seen around the Binsted area, but is likely to be present across the entire Mid Arun Valley landscape.

UKBAP priority species / SPI – Common Toad

- 4.84 A high and likely ancestral breeding population of Common Toad was found centred around Binsted though other suitable areas such as ponds in Tortington, Binsted Rife and the ditch network were not investigated for this species.

- 4.85 These are linked by numerous corridors in the form of the rough grassland along field edges and hedgerows, tall wetland vegetation fringing the numerous ditches and the areas of swamp, fen and marshy vegetation providing ideal damp refuges. Parts of the Binsted Woods Complex, Lake Copse, The Lag and The Shaw also provide excellent habitat that will remain damp all year.

- 4.86 Amphibians require both aquatic and terrestrial habitats in order to breed and survive. Favoured terrestrial habitats are those that are likely to stay damp during the hottest days and the driest seasons providing moist refuges in which to shelter such as rotting wood, tussocks of vegetation, logs and accumulations of leaf litter.

- 4.87 It is likely that Common Toad, along with other amphibians, use much of the landscape across the Mid Arun Valley and could be present in significant numbers.

UKBAP priority species / SPI – European Eel

- 4.88 European Eel elvers migrate along the coastline and into our Sussex river estuaries in order to grow. After 5–20 years in fresh water, the eels become sexually mature and they begin their migration back to the Sargasso Sea to spawn. The connectivity of the landscape is demonstrated by the presence of this species in the lake in Lake Copse and a ditch in Lyminster (Thompson 2016).

UKBAP priority species / SPI – European Hedgehog

- 4.89 The woodland and habitat linkages with shaws, scrubby tree-lines, outgrown hedgerows and unkempt field margins provide excellent Hedgehog habitat. Moreover, the presence of this species is a good indicator of the abundance of ground-dwelling invertebrates and of varied habitat features, such as hedges and copses (Reeve, 1994) as found in the Mid Arun Valley.
-

- 4.90 Various studies indicate that Badger predation is one of the main causes of Hedgehog mortality (Doncaster *et al.*, 1992, Hof and Bright 2010). However, it appears probable that the habitats in the Mid Arun Valley have the diversity and complexity to support viable populations of Hedgehogs despite the known high population of Badgers.

UKBAP priority species / SPI – Harvest Mouse

- 4.91 This species has shown a continual and steep decline since the 1970's attributable to habitat loss (Battersby 2005). However there are corridors and pockets of suitable habitat throughout the Mid Arun Valley.
- 4.92 Just one location, a field adjacent to Tortington Rife, was surveyed for Harvest Mice in 2016, though there are additional significant areas of excellent habitat along Binsted Rife, land to the north of the train line and along the river corridor. Other pockets of suitable habitat in the form of tall rough grassland and bramble bound the arable fields and provide suitable dispersal corridors across the landscape.
- 4.93 This species has been shown to disperse through the area, for a Harvest Mouse nest has previously been recorded in a wayleave in the Binsted Woods Complex.

Invertebrates - landscape

- 4.94 The mosaic of habitats across this landscape has the potential, which has been demonstrated by surveys, to support a wide variety of invertebrates. This diversity provides numerous interfaces such as woodland edges, grassy hedge banks adjacent to bare arable land, lush wetland vegetation adjacent to short grassland.
- 4.95 Interfaces (ecotones) are more species and number-rich than extensive areas of similar-structured habitat. This reflects the juxtaposition of the availability of warmth (exposure to sun), humidity (many insect larvae have major problems with desiccation, but want to be warm to grow quickly) and food resource (botanical diversity - which relates back to the first two resources).
- 4.96 The whole landscape scores very well on interfaces, and it also has other particularly important good quality habitats such as the presence of seepage / streams in woodland and much dead wood habitat.

Invertebrates – dead wood habitat

- 4.97 Dead wood is an extremely important invertebrate habitat and is abundant in the Mid Arun Valley in the Binsted Woods Complex, Lake Copse, The Shaw and narrower shaws, tree-lines and hedgerows.
- 4.98 In the course of Dr Grove's 2016 survey of Lake Copse and two nearby hedgerows, 52 saproxylics (dependent on dead or decaying wood) were identified, and this was measured against the Saproxylic Quality Index (SQI).
- 4.99 The SQI rates the importance of the dead wood habitat, a habitat that is becoming scarcer as rotten branches on trees are removed for safety reasons. Despite the small area covered by this

survey, many species found were uncommon or even rare, and they produced a high score on the SQI.

- 4.100 The overall SQI score of 434 places Binsted about halfway down the list of sites recorded in Southern England. At the top, with a rating of about 850, are sites such as the New Forest and Windsor Forest, while Petworth Park is only just above Binsted. Most of these sites are much bigger and have been studied for much longer.

Invertebrates – a comparison with other important sites

- 4.101 When compared to other good quality sites with similar recording effort the invertebrate diversity in the Mid Arun Valley is extremely high as shown in Table 3.

Table 3: A comparison of the Mid Arun Valley invertebrate diversity

Site	Year	Days	Species number
Mid Arun Valley – partial LWS	2016 / 17	13	551
Midhurst Downs – set of small sites on conservation land – much in SSSI	2016	14	570
Ebernoe Common - LWS	2016	14	565

- 4.102 The high diversity can, in part be attributed to the mosaic of habitats present, the abundant 'edge' habitat providing ecotones, plentiful dead wood habitat and the less common wet woodland with seepage / stream and pond habitats.

Invertebrates - butterflies

- 4.103 The heterogeneous landscape is ideal for butterflies, which require sometimes specific food plants, shelter from strong winds and warmth. The pockets and ribbons of open species rich habitat, the woodland rides, wayleaves and open glades, the field margins such as those around Binsted Park, Tortington Rife and Binsted Rife, the southern margin of the Binsted Woods Complex with sheltered shaws / tree lines / hedgerows and the low lying area between the banks of the Arun and the drainage ditch running alongside provide ideal butterfly habitat.
- 4.104 Despite data from *The State of the UK's Butterflies 2015* showing significant and sustained decreases in abundance and occurrence of both habitat specialist and generalist species of butterfly, the Mid Arun Valley area appears to be showing good diversity and abundance of species.
- 4.105 This is demonstrated in the butterfly recordings that have been consistent from 2015 to 2017 with 27 species recorded in 2015 and a total of 28 species recorded in 2017. This compares well with Arundel Park SSSI, which supports 25 breeding species of butterfly.

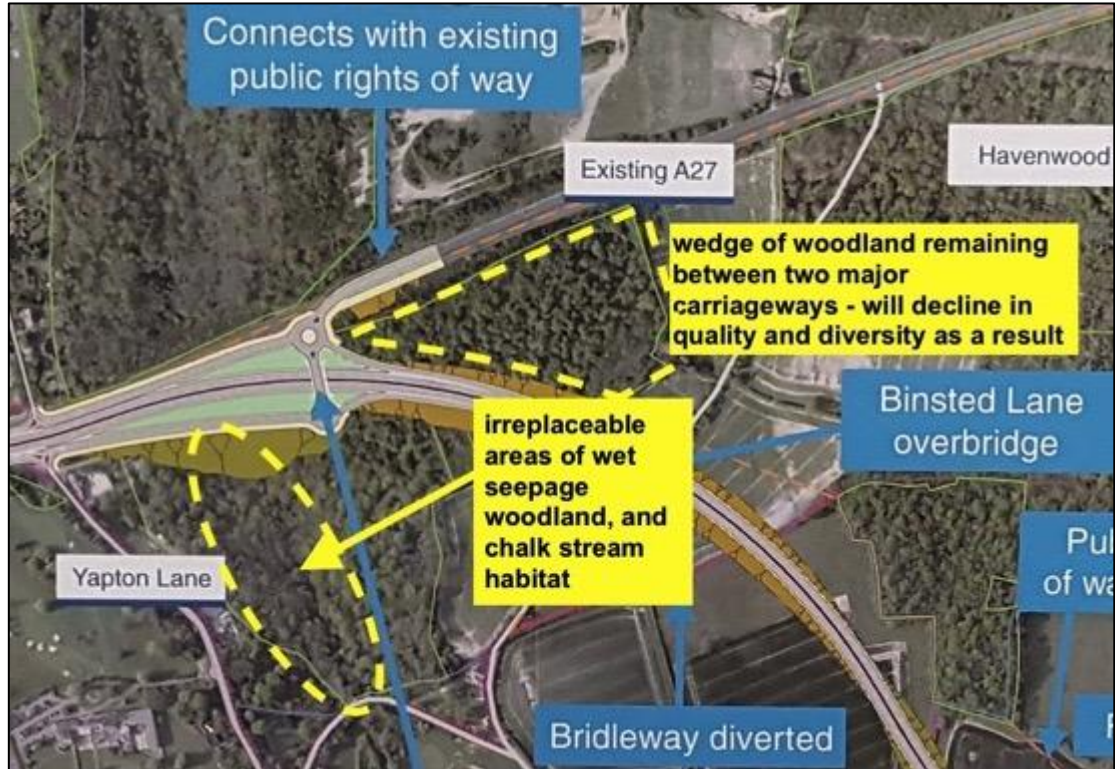
5 IMPACTS

OPTION 5A - HABITATS

Ancient semi-natural woodland

- 5.1 All areas of woodland are within the South Downs National Park and are included in the Binsted Woods Complex Local Wildlife Site. Broad-leaved deciduous woodland and wet woodland are section 41 Habitats of Principal Importance and Option 5A will traverse and destroy / degrade a mosaic of wet and dry woodland in Little Danes Wood and Hundred House Copse (shown in yellow in Figure 3).
- 5.2 Hundred House Copse and Little Danes Wood are a mixture of Ash and Oak woodland. However in areas of springs and seepage the community moves towards W7 *Alnus glutinosa* – *Fraxinus excelsior* – *Lysimachia nemorum* woodland.
- 5.3 Wet woodland combines elements of many other ecosystems and, as such, is important for many taxa. The high humidity favours bryophyte growth and the number of invertebrates associated with Alder, birch and willows, is very large. Two Red Data Book flies and a Nationally Scarce beetle were found by Mike Edwards (2017) in this woodland.

Figure 3: Areas of woodland that will be destroyed or degraded



- 5.4 This habitat is extremely diverse and has species indicative of the chalk influence. This habitat cannot be created elsewhere with tree planting, and the road will lead to the loss of rare

invertebrates, uncommon bryophytes and the stands of hundreds of Early-purple orchids associated with the habitat.

5.5 Moreover, it is stated that 6.6 ha of ancient woodland will be lost (WSP Parsons Brinckerhoff 2017), yet this does not take into account the quality of the woodland (which is extremely high). It also does not take into account the fact that the block of woodland that will remain to the north of Option 5A (Barns Copse) will be severely degraded due to becoming a fragmented 'wedge' of woodland sandwiched between two major carriageways (also shown in yellow in Figure 3).

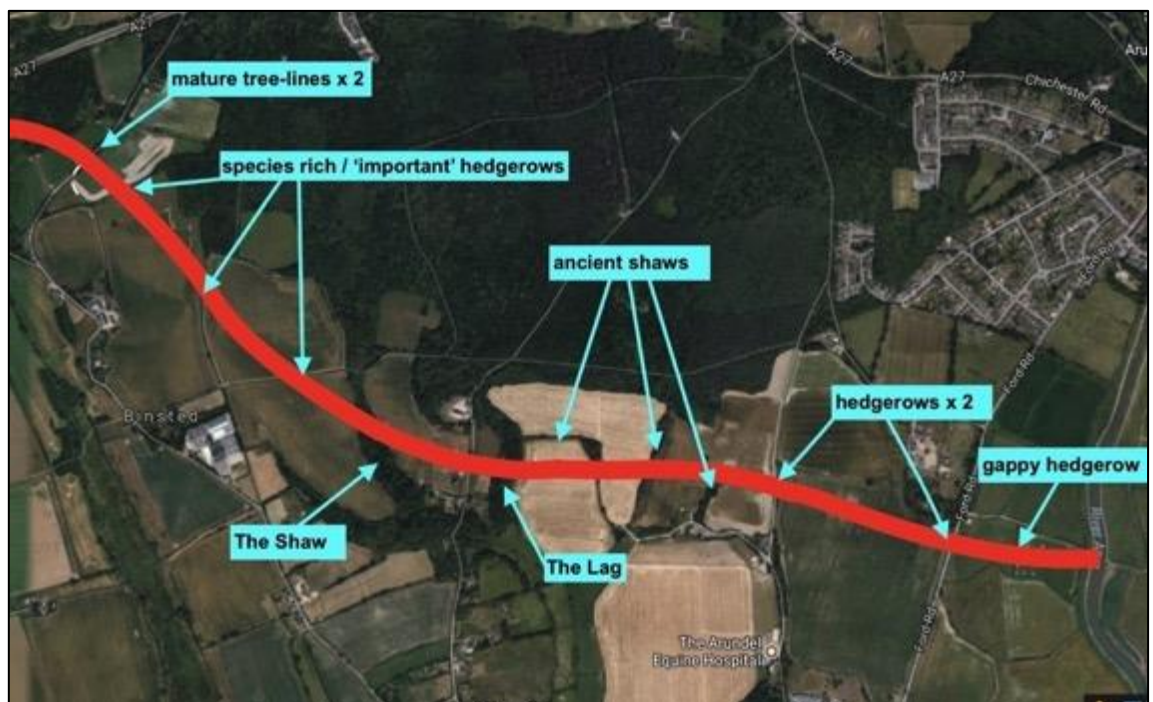
Woodland

5.6 The Shaw is partly ancient woodland and The Lag is wet woodland (formerly classified as wood pasture). Both areas of woodland have a number of veteran trees, are S41 HPI's and within the South Downs National Park. The woodlands are shown in Figure 4.

5.7 The Shaw and The Lag are mosaics of wet and dry woodland with ponds, streams and braided streams supporting a wide diversity of species including ancient woodland indicators and rare plants such as Fritillaries, (listed on the IUCN Red List VU, SxRSI), the uncommon Southern Wood-rush and Wych Elm *Ulmus glabra*, an important food plant for the White-letter Hairstreak *Satyrrium w-album*, a UKBAP and S41 species that could well be present.

5.8 These habitats will be directly lost and fragmented by Option 5A resulting in a disproportional impact to the woodland. The mosaic of habitats that result from the antiquity of the landscape and the watercourses cannot be replicated by tree planting elsewhere.

Figure 4: Ancient shaws, hedgerows and mature tree lines radiating from the Binsted Woods Complex



5.9 The 'W' shape of these three arms of woodland is an iconic landscape feature of the Mid Arun Valley and irreplaceable.

5.10 Additional very narrow strips of woodland or ancient shaws, present on the 1876 OS map Sussex LXII, radiate from the south of the Binsted Woods Complex at Tortington Common and are shown in Figures 2 and 4. These have notable and veteran trees and support a range of less common nesting birds. Due to their antiquity the habitat is irreplaceable.

Hedgerows

5.11 Hedgerows are S41 Habitats of Principal Importance. Option 5A would sever eight hedgerows and two mature tree-lines shown in Figure 4.

5.12 Three of the hedgerows are classified as species-rich of which two, and possibly the third, would be classified as 'Important' under the 1997 Hedgerow Regulations.

5.13 One of these hedgerows is the Copythorn Field west hedge. This hedge has 20 woody species, 90 herbaceous species, 12 sedges, rushes and grasses and 2 ferns. Such hedgerows provide habitats for a diversity of invertebrates that may live in ditches, burrow into banks or be associated with herbaceous plants.

5.14 Option 5A would sever these corridors and change the properties (i.e. humidity, dust, airborne pollutants etc.) of the immediately surrounding hedgerow / shaw / tree-line areas. These factors would have negative impacts on protected and notable species from Dormice to moths.

Notable and veteran trees

5.15 Ancient, veteran and notable trees are a feature of the Mid Arun Valley landscape and are throughout the area, particularly in the woodlands and shaws.

5.16 There are a number of trees that appear to be in the pathway of Option 5A, particularly in The Shaw and Hundred House Copse / Little Danes Wood / Barns Copse.

5.17 Veteran trees support rare fungi, invertebrates and protected species such as bats. They provide a particular series of niches of immense importance to wildlife that cannot be replicated. This habitat is irreplaceable in a human life-time.

Arable field margins

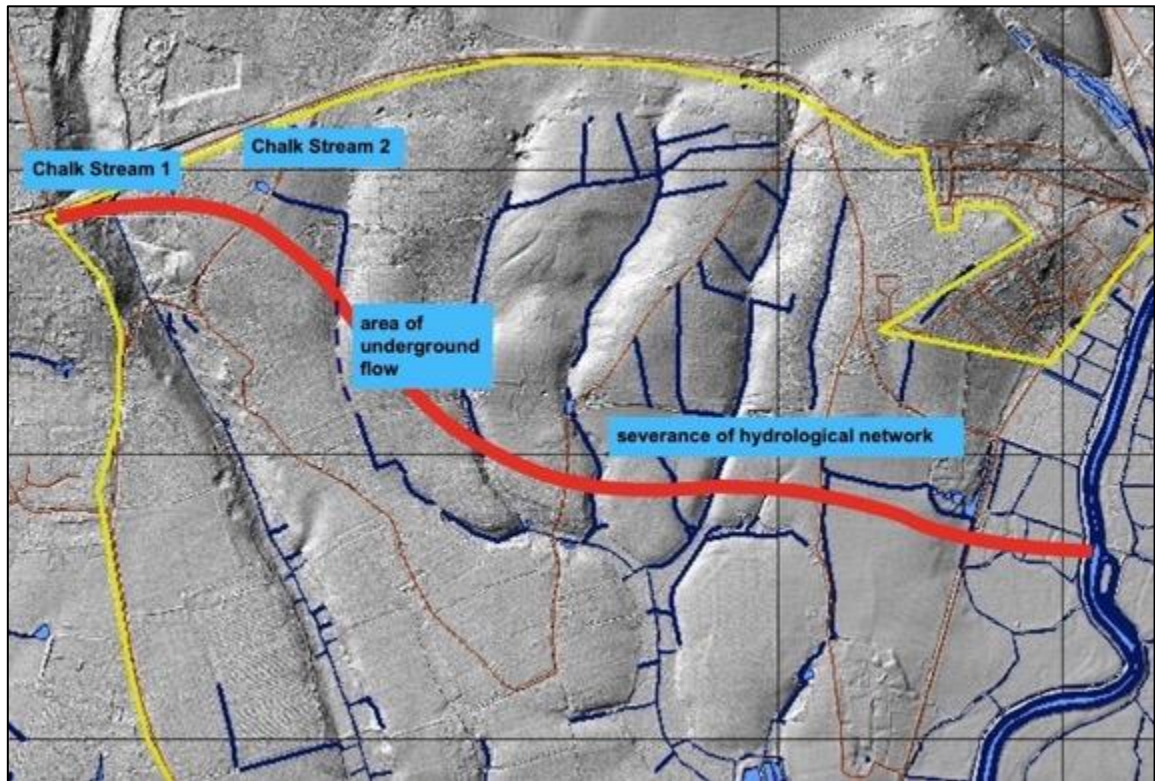
5.18 The main importance of the arable field margins is that they complement the hedgerows and provide habitat and a network of corridors across the landscape for a number of protected species.

Chalk streams

5.19 Option 5A would disrupt the network of watercourses / ditches that drain the higher land of the Binsted Woods Complex. Some of these watercourses originate in the chalk bedrock draining the South Downs. Although the full extent is unknown, two have been identified as chalk streams.

5.20 The extent of the severance / interruption / disruption of the drainage system throughout the entire Mid Arun Valley area is shown in Figure 5 where the approximate course of Option 5A has been superimposed on a LIDAR (Light Detection and Ranging) image.

Figure 5: The Mid Arun Valley stream network on a LIDAR image



Chalk Stream 1

5.21 The first chalk stream follows the boundary between the two woodlands with the valley clearly seen on the LIDAR image (Figure 5). The source is drainage from the South Downs and there are also springs in the woodland, presumably from the same source.

5.22 A major junction is planned right on the stream / seepage system itself. This would break the geological situation where saturated gravels are carrying water from the South Downs.

5.23 This would have enormous implications in terms of road run-off and balancing ponds, which then have very large effects upon the seepage system and its water quality. The proposed cutting is likely to drain the woodland the 'wrong way' for the natural drainage pattern.

5.24 Ultimately this could result in the loss / deterioration of the Binsted Rife Valley chalk stream with additional impacts on the integrated ditch network and the surrounding mosaic of lowland fen and swamp habitat.

Chalk stream 2

5.25 The second chalk stream originates at Sandy Hole Pond, which is likely fed from an underground spring.

- 5.26 This stream flows at times of high rainfall and in the winter along natural boundaries. The dashed line shown in Figure 5 is where it disappears beneath the ground for a stretch along the Copythorn Field west hedge.
- 5.27 It then flows through the Lake Copse woodland where there is a pond, pooling and marshy areas keeping the woodland humid.
- 5.28 This woodland is particularly important for invertebrates, for Dr Grove recorded 96 beetle species in this woodland in 2016 with a different assemblage in the wetter areas. This included one Red Data Book species and 8 Nationally Scarce / Notable species.
- 5.29 The chalk streams and the integrated surrounding habitats are all Section 41 Habitats of Principal Importance and are irreplaceable.

Streams and ditches

- 5.30 Severance / rerouting of the remaining streams / watercourses will have far reaching impacts. There are four main additional watercourses that feed through, from west to east on Figure 5, The Shaw, The Lag and two narrower ancient woodland shaws.
- 5.31 These streams feed into Tortington Rife and into a network of ponds throughout the area. Additionally, variations in geology / soil types in some areas has created a number of different habitats such as braiding of the stream in The Lag, marshy ground at the southern end of The Shaw and swamp communities in fields to the west of Tortington Rife.
- 5.32 Due to these features, some of these areas are unmanaged or seldom managed and therefore of importance to wildlife. Disruption of this system is likely to have a negative impact on Harvest Mice, Water Vole, invertebrates and breeding birds such as Marsh Tit (Red List).
- 5.33 The ditch and pond network throughout the Mid Arun Valley could be lost fully / partially or subjected to differing water regimes. It is also likely to suffer from pollutants from the proposed road.

Ponds

- 5.34 Many of the ponds are directly fed by the streams and ditches and so these may disappear with the destruction / disruption of the land drainage system.
- 5.35 The pond and ditch networks serve as corridors and stepping-stones for dispersal throughout the wider landscape, which would be blocked or impeded by the presence of another road through such a diverse area.
- 5.36 There will also be indirect and less immediately apparent impacts on the ponds (and the stream / ditch network), for the proximity to a major road is likely to cause a degree of deterioration due to nitrates and particulates with the potential to change the species composition. Such deposition has been shown to have an impact for a distance of 200 m from the source (Bignal *et al.* 2008).

Lowland fen and swamp

- 5.37 The loss / alteration / pollution of the Binsted Rife chalk stream will threaten the surrounding lowland fen and swamp habitat, which comprises a good quality mosaic habitat with fen and swamp communities intermixed with grazing marsh.
- 5.38 This habitat supports uncommon communities such as the National Vegetation classification type S28b *Phalaris arundinacea* tall-herb fen, which is extremely species rich in places with uncommon species such as Blunt-flowered Rush and Fen Bedstraw (both on the SxRSI).
- 5.39 It also supports less common species such as those indicative of calcareous conditions including Fan-leaved Water-crowfoot, which is declining throughout its range, Flowering-rush, Mare`s-tail and Whorl-grass (SxRSI).
- 5.40 There will also be an impact on protected species such as Water Vole, Grass Snake, uncommon birds such as Snipe (Amber List), bats and invertebrates.
- 5.41 There can be no mitigation for this S41 Habitat, for it is not only wetland habitat but it has a calcareous influence reflective in some of the species found. It is irreplaceable.

Reedbed

- 5.42 Reedbed is a S41 Habitat and areas will be lost and degraded due to the likely impact on the stream network. Additionally ribbons of reedbed corridors along ditches will be severed.
- 5.43 The largest reedbed in the area is just to the south of the proposed bridge. The siting of the bridge will degrade the quality of this reedbed and likely impact upon the species therein.

Floodplain grazing marsh

- 5.44 The floodplain grazing marsh (S41 Habitat) is part of a corridor from the coast and along the Arun into mid Sussex to areas such as Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks.
- 5.45 Option 5A will cause a direct loss of this habitat and present a barrier across the floodplain grassland and associated drainage ditches with implications as to the viability of protected species in the area.

River corridor

- 5.46 Option 5A will result in an area of river corridor habitat being lost with the possible loss of rare plants.
- 5.47 The bridge over the river is just to the north of a large area of reedbed that is likely to be of importance to breeding birds.

OPTION 5A SPECIES

Badger

- 5.48 The locations of setts and an estimate of territory size attained by bait marking (Dominic Walding 2016) is shown in Figure 6. Different territories are shown in different colours with 'stars' marking the approximate sett locations.
- 5.49 The sett in The Shaw will be destroyed by Option 5A and two territories are in the path of the proposed road.

Figure 6: Badger setts and territories in the pathway of Option 5A

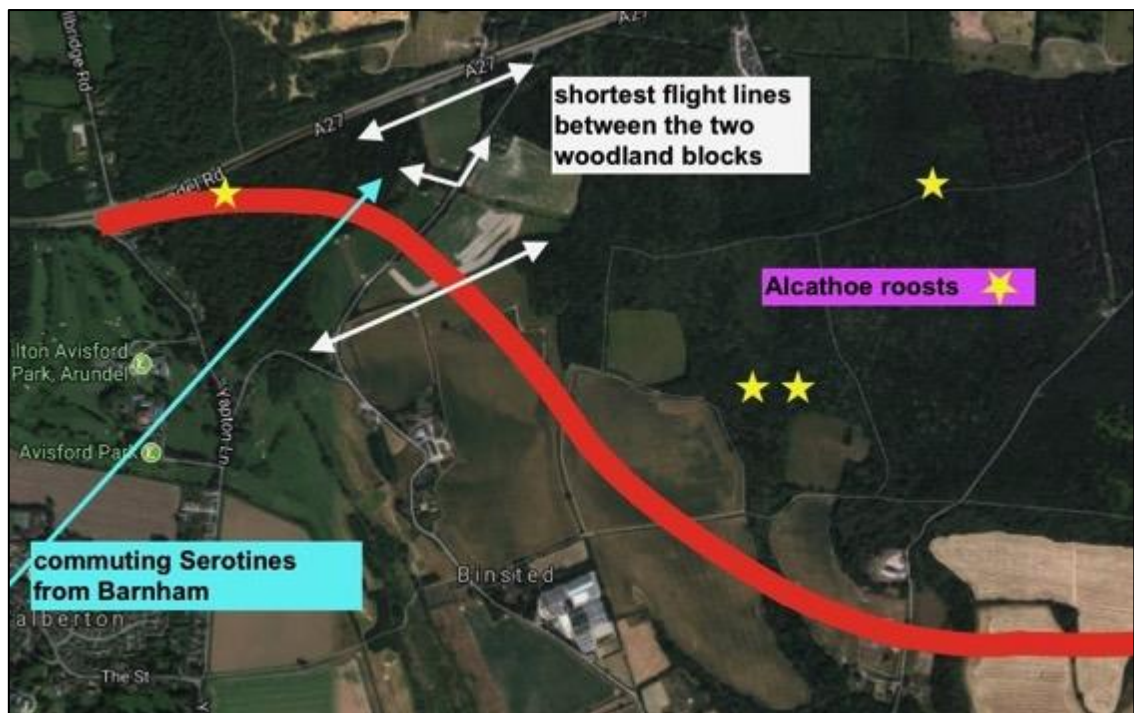


- 5.50 Mitigation will be required in the form of excluding Badgers from the sett to be destroyed (The Shaw) and providing an artificial sett if there is no other sett available within the territory.
- 5.51 Given that the Badger population is extremely high mitigation will be required to ensure that this species can cross the road safely. This would be achieved by the provision of purpose-built underpasses and badger-proof fencing to stop individuals being killed. It is important that such underpasses are located on or close to existing badger paths.

Bats

- 5.52 The movements of bats appear to be throughout the Binsted Woods Complex including the block of woodland to the west (Hundred House Copse / Barns Copse / Little Danes Wood). Flight lines in the form of tree-lines and hedgerows readily connect the two blocks of woodland (shown in Figure 7). Option 5A would sever all these corridors.
- 5.53 Alcaethoes, a UKBAP priority species, is the rarest species found, with maternity roosts discovered in both blocks of woodland (Figure 7). Alcaethoes maternity roosts have only been found in 3 counties and this is the most southern known colony in the UK. Option 5A would sever links between the roosts.

Figure 7: Alcaethoe roosts and flight lines



- 5.54 Serotines are one of our less common species, occurring mainly south of a line drawn from The Wash to South Wales. It roosts in buildings and tends to feed on larger invertebrates such as chafers. Option 5A will impact upon this species commuting from its roost sites in Barnham.
- 5.55 Option 5A will result in a loss of foraging habitat for Bechstein's bats, (three roosts found to date) which is predominantly mature native woodland, notably Oak woodland, which will be lost in The Shaw and Hundred House Copse / Little Dane's Wood.
- 5.56 Barbastelles are known to be roosting in the woodland with a roost found at the western side. It is possible that more roosts are throughout the woodland as Barbastelles are tree roosting specialists and more commonly found in old woodland roosting in veteran / damaged trees.
- 5.57 Barbastelles are known to forage over a wide area utilising both woodlands and farmland / floodplains for foraging, and so Option 5A will present a barrier between roosting and foraging areas.

- 5.58 A number of bat species have been found flying in The Shaw in the location of Option 5A including Natterers bat, Alcathees, Brown Long-eared and Nathusius Pipistrelle. This route would sever these foraging corridors and habitat linkages.
- 5.59 Based on the limited bat data collated to date, the highest impact of Option 5A will be on Alcathees. This species uses a lot of maternity roosts and there are likely to be more in the woodlands.
- 5.60 Given the importance of this woodland to a range of bat species, including some of our rarest species, Option 5A would require mitigation and enhancements to ensure connectivity is maintained between the blocks of woodland. Suitable mitigation would be the construction of underpasses or green bridges in the path of existing flight lines.
- 5.61 Mitigation would also require that artificial lighting is not used along the carriageway as most bat species, including Bechstein's bats, will avoid lit roads.

Birds

- 5.62 The extent on the impact of birds is impossible to quantify due to unknowns such as the extent of the loss and degradation of habitat that would be expected from Option 5A such as the ditch network, Binsted Rife swamp and fen.
- 5.63 Option 5A is likely to have a high adverse impact on birds of the open country such as farmland birds; a group that have suffered the most severe declines. It is likely to have a high adverse impact on other groups of birds such as wildfowl and wetland species and low-flying species.
- 5.64 Option 5A is likely to have a high adverse impact on the Barn Owl, which is known to have several breeding sites in and around Binsted. This is a low, slow flying species affected by collisions with vehicles. Option 5A is likely to sever important foraging areas from nesting sites and increase the risk of death and injury from vehicle collisions.
- 5.65 Option 5A traverses one field and is adjacent to another that have been used by swans Mute Swan *Cygnus olor* (Amber List) and likely Bewick's Swan *Cygnus columbianus* (Amber List), as a wintering roost area for over 50 years if not more.
- 5.66 Swans are routinely seen scattered throughout the fields, shown in Figure 8, in their hundreds (200 – 300 estimated) in the spring and autumn. Arundel residents describe the sight thus 'as though the fields were strewn with hundreds of white tissues.'
- 5.67 These are low-flying birds, which succumb to road deaths on the current bridge. There is likely to be a much-increased risk of this with the proposed road within such close proximity to this roost site.
- 5.68 The additional bridge is also likely to escalate the number of swans killed by roads at such crossings as they fly along the Arun.
- 5.69 The proposed bridge is adjacent to a large area of reedbed (Figure 9), which has the potential to be used by rare species such as Bittern *Botaurus stellaris* (Amber list) due to its isolated location. The potential for other birds and protected species has not been investigated due to lack of access.

Figure 8: Roosting site for two to three hundred swans



Figure 9: A large area of reedbed adjacent to proposed additional bridge siting



- 5.70 Much of the negative impact on birds will be ‘invisible’ due to a decrease in breeding numbers near roads. A 5-year research programme at Harvard University (Forman *et al.* 2002) concluded that birds might be strongly affected by traffic volume or changes in volume. With traffic of 15,000–30,000 cars per day (a two-lane highway), both bird presence and breeding were decreased for a distance of 700 m. A heavy traffic volume of $\geq 30,000$ vehicles / day saw bird presence and breeding reduced for a distance of 1200 m from a road.
- 5.71 The Mid Arun Valley is part of a corridor from the coast and along the Arun into mid Sussex to areas such as Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks. These form the Arun Valley Special Protection Area (for rare and threatened birds) with very high numbers of over-wintering waterfowl. All these species have been recorded in the Mid Arun Valley area (Thompson 2016) and the impact of increased infrastructure in this area would be difficult to quantify.
- 5.72 The bird diversity and the number of birds in the Mid Arun Valley area is at least of Regional Importance and could well be of National Importance, particularly if considered with the ‘green corridor’ of wetland and wildfowl species.
- 5.73 Mitigation for birds is usually concerned with the immediate destruction of breeding habitats and the creation of nesting sites for the more widespread species. It does not take the wider issues into account.

Dormouse

- 5.74 Dormice are known to be breeding throughout the Binsted Woods Complex, with Figure 10 showing the exact locations of where Dormice or Dormice nests have been found. The population is considered likely to be key to sustaining Dormice in the surrounding areas and therefore of Regional Importance.
- 5.75 Option 5A will have a direct impact on this species by traversing three areas of woodland that support breeding Dormice, Hundred House Copse, The Shaw and the Lag.
- 5.76 Option 5A will sever corridors that allow this species to disperse from a sizable breeding and important core population in the Binsted Woods Complex to smaller woodlands, copses, shaws and outgrown hedgerows within the Mid Arun Valley and beyond.
- 5.77 The Binsted Woods Complex is the biggest and only continuous and sizable block of woodland in the area and along the coastal plain to the south of the A27. Figure 11 shows its size and importance for Dormice in the wider area.
- 5.78 The Severance of the dispersal corridors, that may lead as far as the Climping Gap, Angmering and Chichester harbour, would potentially have high adverse impacts on the regional population of Dormice.
- 5.79 A range of protected species as well as Dormice, such as reptiles, amphibians and small mammals are likely to use these corridors across the landscape.

Figure 10: Known breeding locations for Dormice in the Binsted Woods Complex

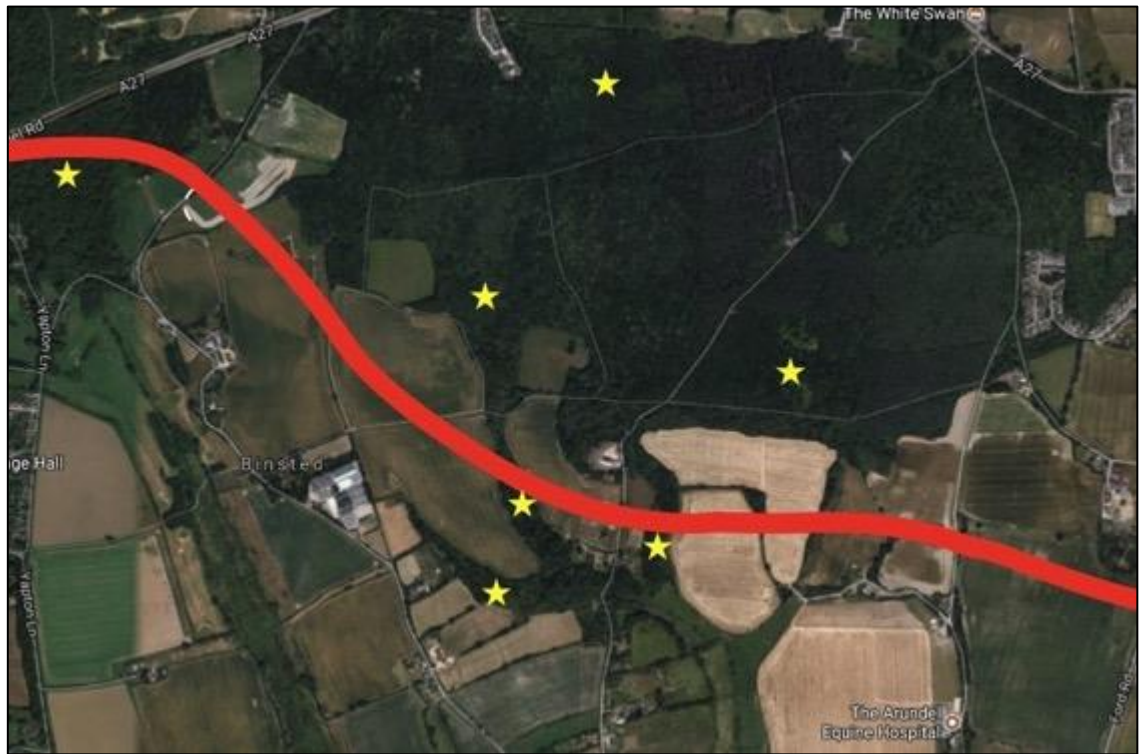
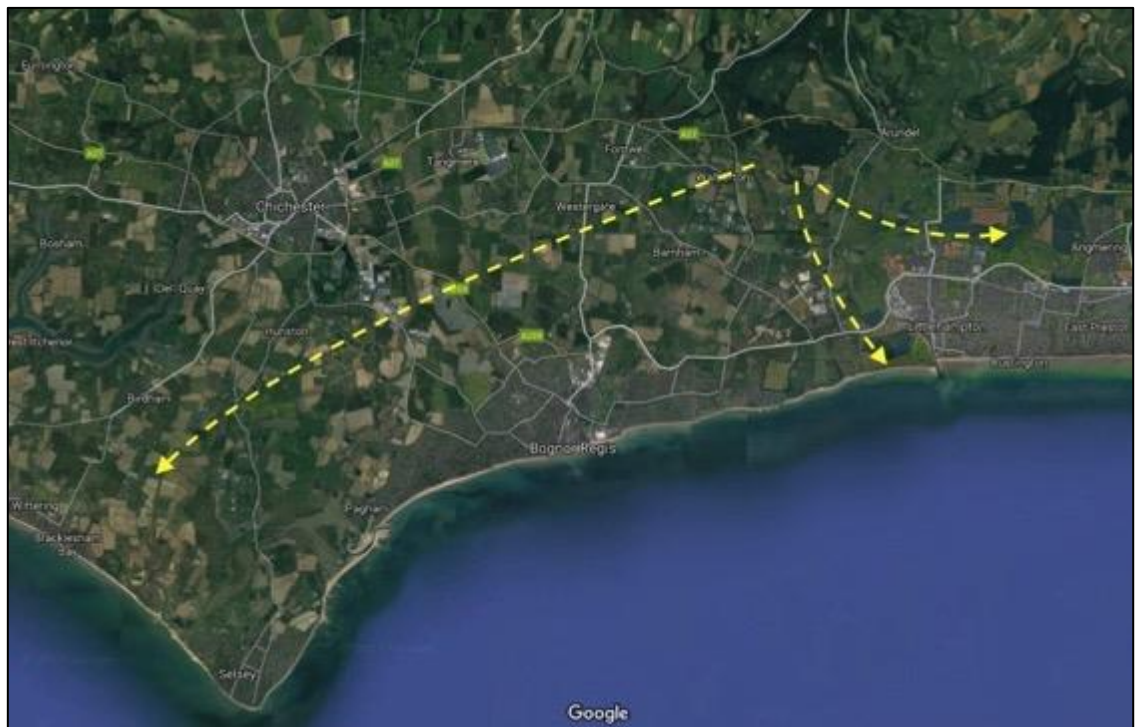


Figure 11: Potential regional dispersal corridors for Dormice from the Binsted Woods Complex



Great Crested Newt

5.80 If this species is not in the area then it may have undergone a local extinction at some point in the past, and there is no good reason why this species cannot once again occupy the suitable habitat in the Mid Arun Valley area.

5.81 However, Option 5A will pose significant barriers to dispersal for Great Crested Newt, for it will no longer be able to access all the water bodies and terrestrial habitat that are currently available.

Otter

5.82 There are a number of undisturbed areas within the Mid Arun Valley that would offer excellent locations for Otter holts. The best areas are Binsted Rife, land to the west of Tortington Rife, land to the north of the railway line and pockets of wet woodland.

5.83 Option 5A, by severing the network of watercourses feeding these streams and ditches, is likely to change the hydrology of the entire area and have a negative impact upon these sites.

5.84 This will have a negative impact on Otters, if in the area, as there are so few undisturbed and suitable potential nesting sites for this species in this part of the county.

Reptiles

5.85 The mosaic of habitats found in the Mid Arun Valley is ideal for reptiles and therefore the populations of all four species in the area is believed to be extremely high and of Regional Importance.

5.86 Reptiles routinely move across areas of landscape and, particularly Grass Snake, will traverse large areas of in order to search for suitable breeding sites, productive foraging locations and suitable hibernation sites.

5.87 Standard mitigation would include removal of all reptiles from the road development and a Temporary Amphibian / Reptile Fence to be installed along the entire carriageway in order to keep individuals away from works while in progress.

5.88 However, Option 5A will sever the habitat linkages (shown in Figure 4), particularly from prime woodland hibernation sites to foraging and breeding areas. A major barrier across this landscape is likely to result in high direct mortality and a gradual decrease in the population sizes of all four reptiles.

Water Vole

5.89 Option 5A will create an additional road across the floodplain grassland and alter the hydrology of the watercourses to the north of the floodplain grassland. Wetland habitats in Sussex are at 'critical' and yet they are regularly being destroyed, damaged and fragmented by developments such as proposed Option 5A.

5.90 The current bypass has several culverts through which Water Voles can potentially traverse. However, these also serve as 'pinch points' where Water Vole may be open to higher levels of

predation. The proposed road would provide another set of pinch points with a relatively small area of floodplain grassland sandwiched between two roads. This is likely to increase predation and decrease dispersal to negligible levels.

5.91 Ditch networks, though cited as being 'ideal' habitat for Water Voles, only provide marginalized wetland habitats within strict linear confines, allowing efficient Mink predation. The more complex habitat in parts of the Mid Arun Valley area, with the wetland surrounding Binsted Rife, the fields to the west of Tortington Rife, the reservoirs to the south of the area and the woodland around Lake Copse, currently provide refuges for the species.

5.92 Water Vole has been found at low levels, which may be due to predation from Mink. However, as the wider population is so fragile, the presence of Water Vole in the Mid Arun Valley is considered to be of Regional Importance.

5.93 Alteration of this habitat and the ability of this species to disperse effectively will have a high adverse impact and may well result in the loss of Water Vole from the Mid Arun Valley area.

UKBAP priority species / SPI Brown Hare

5.94 The Brown Hare is known to be across the farmland in the Binsted area and is likely to be across the entire Mid Arun Valley area considered to be of Regional Importance.

5.95 Brown Hare has been shown to have high mortality rates on roads, to avoid habitats fragmented by large roads and to be found in far lower abundances in areas with large roads (Roedenbeck and Vosser 2008).

5.96 Option 5A is likely to have a high adverse impact on the known population of Brown Hare in the area to the extent that it may be lost.

UKBAP priority species / SPI Common Toad

5.97 The Common Toad population appears to be high and the locations of this species within the last two years are shown in Figure 12. The smaller yellow stars are where Common Toad has been seen crossing roads, and the larger yellow star is where they are routinely seen in substantial numbers in woodland with a wet flush (Noor Wood).

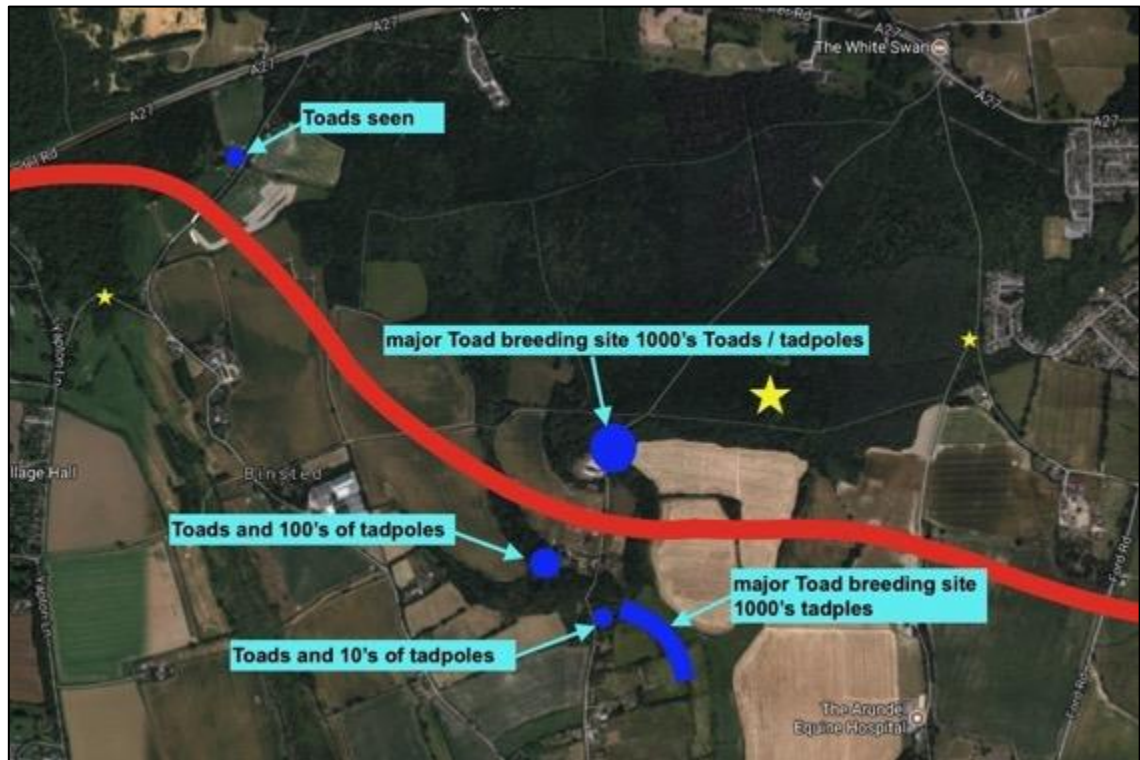
5.98 It is likely that additional Common Toad breeding sites are in the area such as Binsted Rife, the ponds around Tortington and other wet ditches. The population is likely to be of Regional Importance.

5.99 Common Toad habitually migrates to ancestral breeding ponds each year. They follow the same route, regardless of what gets in their way, which would lead to potentially high fatalities on the proposed road thereby impacting on the local population year on year.

5.100 Option 5A will have a high adverse impact upon Common Toad by cutting across the watercourses that feed into some of the ponds and ditches that are used for breeding.

5.101 Option 5A will have a high adverse impact on Common Toad by dissecting the interconnected terrestrial and wetland habitat resulting in high fatalities. This is likely to have a high adverse impact on the Mid Arun Valley population of Common Toad.

Figure 12: Common Toad locations



5.102 Mitigation would be dependent upon the location and number of Common Toad breeding sites and the way in which they utilize the landscape. Underpasses / bridges would be required in order to facilitate access to ancestral breeding sites. Additionally the creation of breeding sites to replace those lost would also be required.

5.103 However, it is still likely that without barriers, high numbers of Common Toad would be killed on the proposed road.

UKBAP priority species / SPI European Eel

5.104 The movement fish, such as the European Eel, may be impeded by the presence of an additional road cutting through a high number of ditches.

5.105 Any action that threatens the stream and ditch network in the area would have an adverse impact upon this species in the Mid Arun Valley.

5.106 Fish passage can be blocked by improperly functioning stream culverts or by a lack of them, creating an often-impassable barrier. Schaefer *et al.* (2003) reported that culverts restricted movement of the Darter *Percina pantherina*, a North American fish.

UKBAP priority species / SPI European Hedgehog

5.107 The population density of Hedgehogs is unknown in the Mid Arun Valley. However, due to the continuing decline of this species, it is considered that the Mid Arun Valley offers an uninterrupted landscape for Hedgehogs to persist. The population is therefore considered to be of Regional Importance.

5.108 Option 5A will impact on this species by creating a barrier to dispersal across the landscape and likely have a high adverse impact. Mitigation will likely be ineffective unless barriers are used to prevent high road kill numbers.

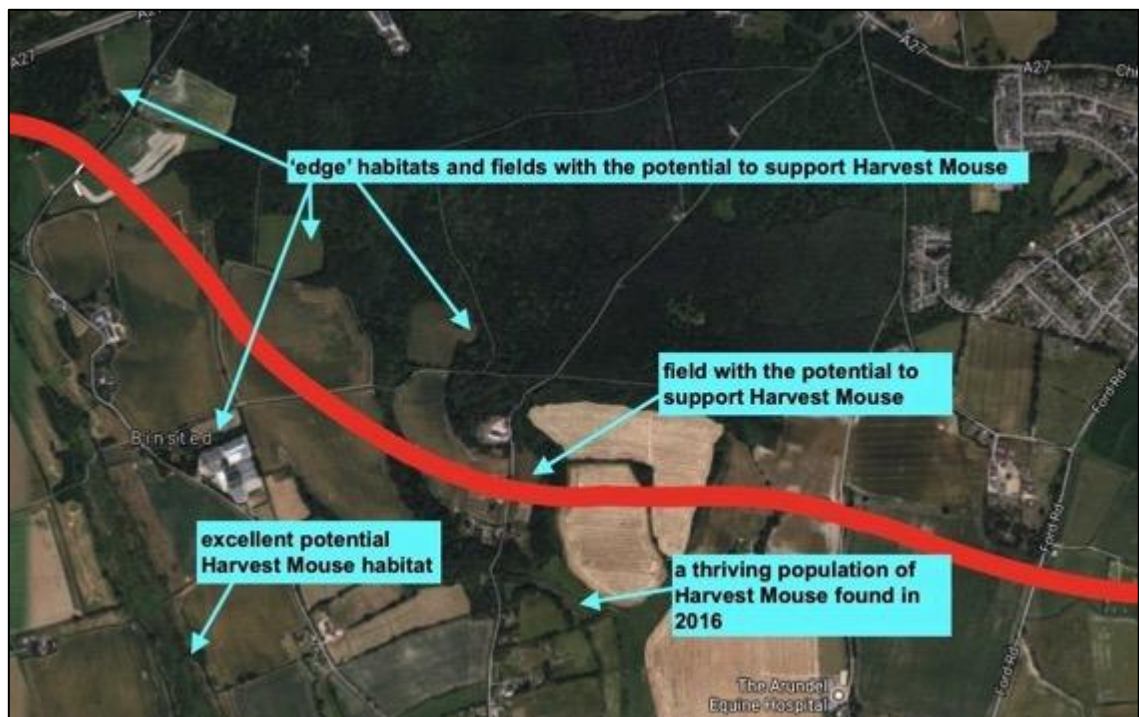
UKBAP priority species / SPI – Harvest Mouse

5.109 Suitable habitat for Harvest Mouse is to the north and south of Option 5A. One such area was surveyed and found to support a good population of this species (shown in Figure 13). The population of this declining species is considered to be of Regional Importance.

5.110 Habitat corridors of rough grassland and scrub along field edges, hedgerows and ditches link areas of suitable habitat.

5.111 Figure 13 shows that the areas of potential Harvest Mouse habitat and the ‘edge’ habitat and corridors for movement will be severed by Option 5A. Option 5A may also result in a deterioration of habitat for this species due to the potential loss of seldom managed rough and marshy grassland. There will likely be a high adverse impact for Harvest Mouse.

Figure 13: Harvest mouse population and some other suitable locations



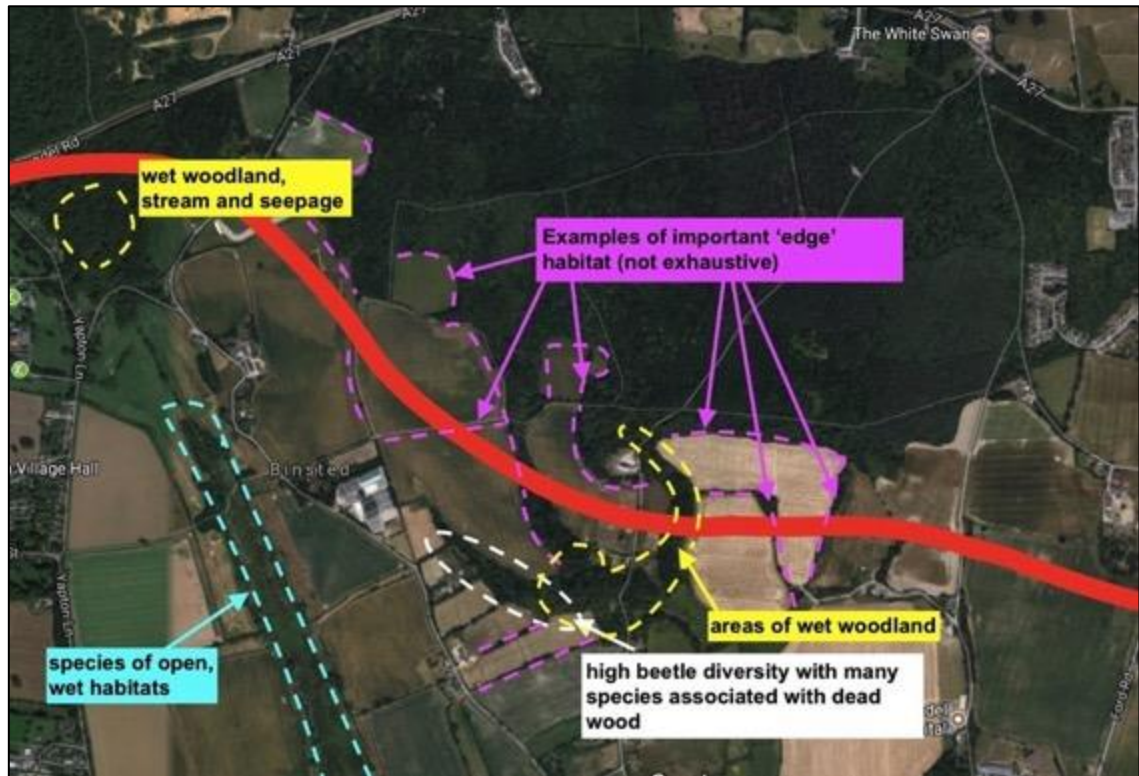
Invertebrates

5.112 The invertebrate diversity is high across the areas of the landscape surveyed to date. The east part of the landscape has not been surveyed. Key areas that are of importance to invertebrates are shown in Figure 14. This does not include the main block of woodland, which has not been surveyed since 2006 (Grove 2006).

5.113 Option 5A would have the highest adverse impact in areas of wet woodland with streams and seepages. These areas are non-replaceable / replicable and therefore cannot be mitigated for.

- 5.114 Option 5A would result in the loss of a good quantity of dead wood habitat (both standing and fallen) in mature trees in The Shaw, The Lag and Hundred House Copse / Little Danes Wood. This habitat is not replaceable even in the mid or long term and so cannot be mitigated for.

Figure 14: Areas of importance to invertebrates



- 5.115 The functioning of the area as a 'whole' with its high invertebrate diversity (on a par with Ebernoe and an SSSI) cannot be mitigated for. The high numbers and diversity of invertebrates together with significant numbers of Nationally Scarce and Red Data Book species would put invertebrates, as a collective whole, on a level of at least Regional, if not National Importance.
- 5.116 There are many hidden impacts for invertebrates such as roads forming barriers to dispersal and causing high direct mortality found in dragonflies by Soluk *et al.* 2011. Other problems highlighted in a *Buglife* report include attraction to artificial lights, ovipositing on artificial surfaces, disruption to feeding, disruption to breeding and disruption to moving across the landscape (Bruce-White and Shardlow 2011).
- 5.117 Such factors have contributed to the widespread decline of key groups such as dragonflies and damselflies, butterflies and moths and cannot be mitigated for. Their decline will have knock-on effects on the birds, bats and mammals, which depend on them for food, and is a reflection of the continuing and widespread degradation of our environment.

AVOIDANCE OF HUNDRED HOUSE COPSE

- 5.118 Superficially, the impact on ancient woodland at Hundred House Copse, Little Danes Wood and Barns Copse together with the impact on one of the chalk streams (Binsted Rife) could be avoided with a roundabout joining Option 5A to the current A27 in between the two blocks of ancient woodland.
- 5.119 This would separate the two woodland blocks and leave Hundred House Copse isolated from the main woodland block.
- 5.120 This would still have severe impacts on Dormice, commuting bats, Alcaethoe bats commuting between nursery roosts, Hedgehogs and Badgers.
- 5.121 It would degrade and likely destroy Sandy Hole Pond, originating from a chalk spring, and sever the remainder of the chalk stream that leads from the pond to Lake Copse and Tortington Rife.
- 5.122 The road would be extremely close to the west side of the main block of woodland, degrading and more severely impacting on the varied 'edge' woodland habitat that currently is of high quality due to the fact that it is bounded by fields.
- 5.123 This option was considered in 1993 by the then Secretary of State to be unacceptable. It was reasoned that in time it would be altered to the Yapton Lane junction as currently proposed, with its associated ecological harm.
- 5.124 This option would therefore ultimately lead to an escalation in long-term damage to the environment.

IMPACTS OPTION 3 - HABITATS

Ancient semi-natural woodland

- 5.125 All areas of woodland are within the South Downs National Park and are included in the Binsted Woods Complex Local Wildlife Site. The entire area of woodland to be impacted upon is classed as either Ancient Woodland or Plantation on Ancient Woodland Sites.
- 5.126 The woodland comprises a diverse matrix of plantation, plantation intermixed with broadleaved woodland and broadleaved woodland. There are small wet flushes, streams and ditches adding to the diversity.
- 5.127 The ground flora reflects this diversity with species indicative of base-rich or neutral woodlands found elsewhere in the woodland growing in close proximity to those of acidic substrates such as Tormentil *Potentilla erecta* Green-ribbed Sedge *Carex binervis* and the moss *Hypnum jutlandicum*.
- 5.128 The plantation is often varied, an example being Larch plantation with frequent birch growing above a patchy shrub layer of coppiced Hazel and the odd veteran Beech tree. This diversity in woodland age and type is responsible for the high diversity of invertebrates found.

5.129 Option 3 would result in a significant loss (approximately 24 ha of this woodland). It would sever the stream network and the ancient track way, Old Scotland Lane, which boasts a huge diversity of sedges and butterflies along its length.

5.130 Option 3 would create a large amount of woodland 'edge' along the carriageway. This would not be the same quality as 'edge' habitat adjacent to fields, as it would be prone to dust and pollutants. It will also allow species associated with edge habitats, and not usually found in the interior of such a large block of woodland, to spread along the carriageway and possibly into the woodland.

Hedgerows

5.131 Hedgerows are S41 Habitats of Principal Importance. Option 3 would sever five hedgerows to the west of the Arun.

5.132 Two of these hedgerows are along Tortington Lane and two along Ford Road providing corridors from the Binsted Woods Complex. The fifth is a field hedge.

5.133 The hedgerows tend to be dominated by just one or two species with gaps infilled with dense Bramble that has, in effect, become part of the hedgerow corridor.

Notable and veteran trees

5.134 Ancient, veteran and notable trees are a feature of the Mid Arun Valley landscape and are throughout the area, particularly in the woodlands and shaws.

5.135 It is likely that a number of important trees will be in the pathway of Option 3 as this traverses such a big and uninterrupted block of ancient woodland.

5.136 Veteran trees support rare fungi, invertebrates and protected species such as bats. They provide a particular series of niches of immense importance to wildlife that cannot be replicated. This habitat is irreplaceable in a human life-time.

Arable field margins

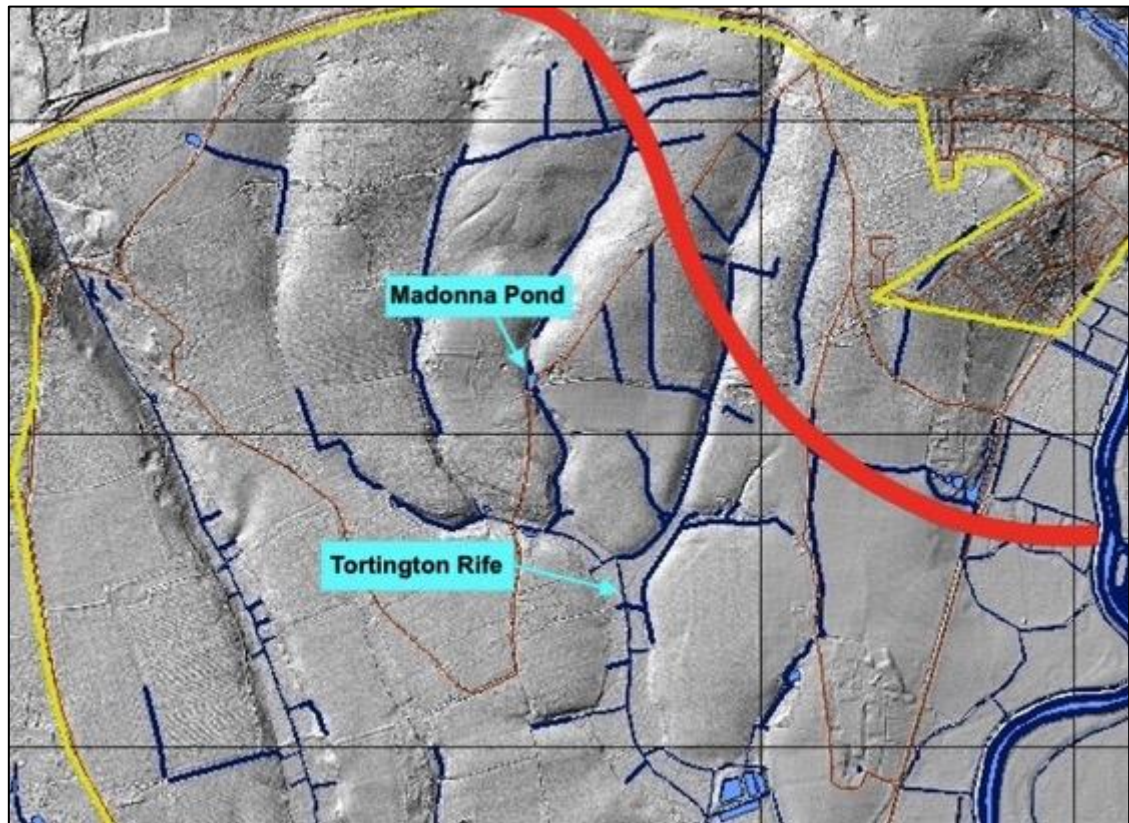
5.137 This Option cuts through two arable field margins that provide grassy corridors from the Binsted Woods Complex. Though still useful, these will be used by a more limited range of species than use the hedgerow corridors.

Streams and ditches

5.138 There are three main watercourses that feed through to, from west to east on Figure 15, the Madonna Pond and The Lag, Tortington Rife and a number of ponds in various locations in Tortington.

5.139 The source of the streams is unknown and while it is clear that they are draining the Binsted Woods Complex, there may also be some input from drainage of the South Downs.

Figure 15: A LIDAR image of streams and ditches impacted by Option 3



- 5.140 The Lag is an area of wet woodland with a braided stream leaving wet pools in the winter. Some fields that are rich in wildlife surround Tortington Rife. These fields are occasionally inundated which has resulted in areas of swamp and wetland vegetation that has made management difficult.
- 5.141 Due to occasional water incursion and a lack of regular management, these fields are of importance to wildlife. Disruption of this system is likely to have a negative impact on Harvest Mice, Water Vole, invertebrates and breeding birds such as Marsh Tit (Red List).
- 5.142 The ditch and pond network throughout a large section of the Mid Arun Valley could be lost fully / partially or subjected to differing water regimes. It is also likely to suffer from pollutants from the proposed road.

Ponds

- 5.143 Many of the ponds are directly fed by the streams and ditches and so these may disappear with the destruction / disruption of the land drainage system.
- 5.144 The Madonna Pond (Figures 12 and 15) is of particular importance as this appears to be a major breeding site for Common Toad (along with Tortington Rife). Other ponds in Tortington could also be important for amphibian breeding though these have not been surveyed.

- 5.145 The pond and ditch networks serve as corridors and stepping-stones for dispersal throughout the wider landscape, which may be lost if Option 3 were to change the hydrology, or may deteriorate in quality due to pollutants.

Reedbed

- 5.146 Reedbed is a S41 Habitat and areas will be lost and degraded due to the likely impact on the stream network. Additionally ribbons of reedbed corridors along ditches will be severed.
- 5.147 The largest reedbed in the area is just to the south of the proposed bridge. The siting of the bridge may degrade the quality of this reedbed and likely impact upon the species therein.

Floodplain grazing marsh

- 5.148 The floodplain grazing marsh (S41 Habitat) is part of a corridor from the coast and along the Arun into mid Sussex to areas such as Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks.
- 5.149 Option 3 will cause a direct loss of this habitat and present a barrier across the floodplain grassland and associated drainage ditches with implications as to the viability of protected species in the area.

River corridor

- 5.150 Option 3 will result in an area of river corridor habitat being lost with the possible loss of rare plants.
- 5.117 The bridge over the river is just to the north of a large area of reedbed that is likely to be of importance to breeding birds.

OPTION 3 - SPECIES

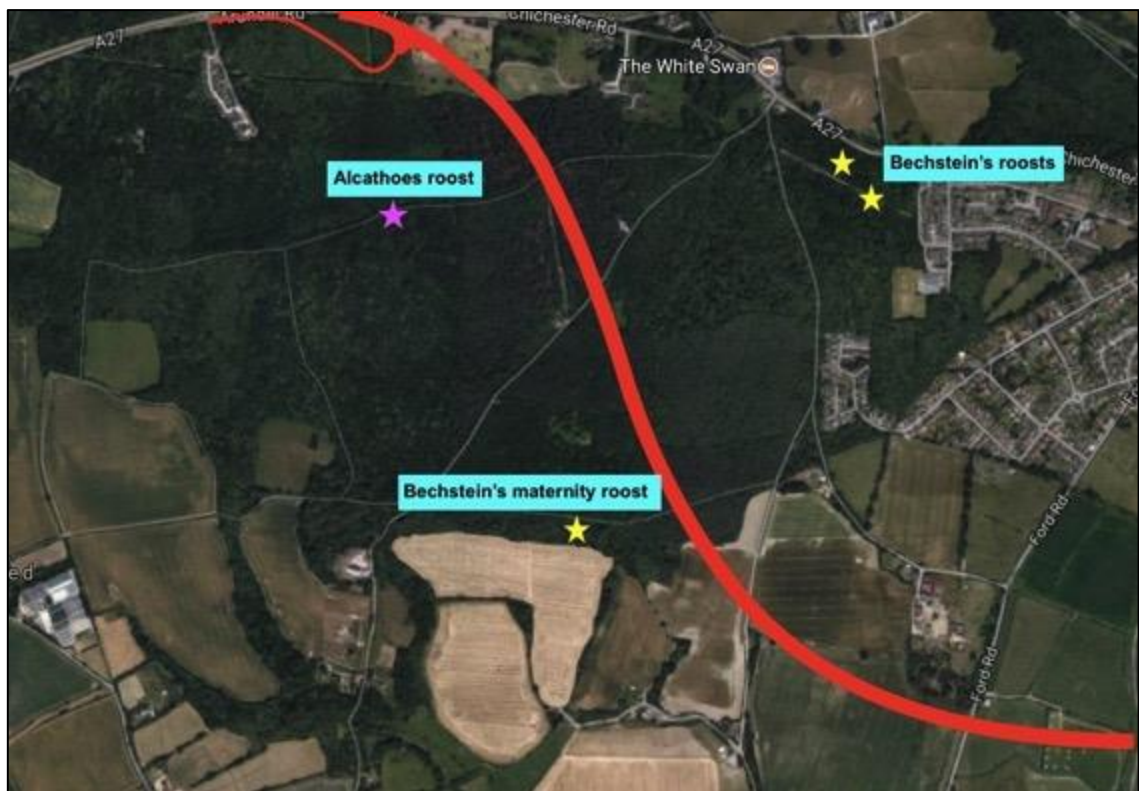
Badger

- 5.151 Badger foraging activity has been observed in Paines Wood to the west, Jupps Wood to the east and within the approximate pathway of Option 3 in Tortington Common.
- 5.152 Although no Badger setts have been found in this area of woodland, given that the Badger population is high elsewhere in the area, and signs of activity within the woodland are frequently recorded, it is highly probable that Option 3 will traverse setts or territories.
- 5.153 Mitigation will be required to ensure that the road can be crossed safely. This would be achieved by the provision of purpose-built underpasses and Badger-proof fencing to stop individuals being killed. It is important that such underpasses are located on or close to existing badger paths.

Bats

- 5.154 The movement of bats appears to be throughout the Binsted Woods Complex and the surrounding habitats. Veteran trees, a stream network, marshy areas, small sheltered glades, wayleaves and footpaths enhance the woodland for foraging bats.
- 5.155 The severance of the woodland by a major road will reduce the foraging habitat for species that will not cross this barrier, thereby impacting upon the viability of the fragmented population. The greatest impact will be on Bechstein's bats (Annex II species). This species forages within mature native woodland, notably oak woodland, and is reluctant to leave an area of continuous canopy cover.
- 5.156 A more serious impact on Bechsteins is the location of the road, which will form a barrier between a Bechstein's maternity roost along the southern edge of Tortington Common and two other roosts in Stewards Copse shown in Figure 16. Bechstein's bats will routinely move between roost sites.

Figure 16: Option 3 presenting a major barrier between Bechstein's roosts



- 5.157 An Alcathoes roost is to the west of Option 3, and it is possible that this species may have additional roosts to the east of Option 3.
- 5.158 Given the frequency of veteran / notable trees throughout the Binsted Woods Complex, it is possible that other very rare tree-roosting species such as Barbastelles (Annex II), which have a known roost in the western part of woodland, may be throughout the Complex.

5.159 Surveys carried out on behalf of MAVES have been minimal and only touched upon bat activity within a small part of the Binsted Woods complex. Despite this, a high number of bats and roosts have been found. This can, in part, be attributed to a large and uninterrupted block of ancient woodland.

5.160 Option 3 would present a barrier between the two blocks of woodland and impact upon the extent of available foraging area. Mitigation would be required for this barrier in the form of a major green bridge with a continuous canopy cover.

Birds

5.161 Option 3 is likely to have a high adverse impact on woodland birds including those of coniferous woodland. It is likely to have a high adverse impact on other groups of birds such as wildfowl and wetland species and low-flying species.

5.162 Conifers are likely to increase the bird diversity with species such as Goldcrest *Regulus regulus*, Siskin *Carduelis spinus*, Crossbill *Loxia curvirostra*.

5.163 Tawny Owl *Strix aluco* is frequently heard in the Binsted Woods Complex and will roost in trees and frequently hunt in open areas with Option 3 both destroying habitat and providing a potential barrier. Research has shown that the density of Tawny Owl and Little Owl is much lower near major roads with the impact reaching up to 2km (Silva et al 2012).

5.164 The route of Option 3 to the east of the Arun is as Option 5A traversing a field used as a winter roost by swans for over 50 years if not more. (Paragraph's 5.65 – 5.68 and Figure 8).

5.165 The proposed bridge is adjacent to a large area of reedbed (Figure 9), which has the potential to be used by rare species such as Bittern due to its isolated location. The potential for other birds and protected species has not been investigated due to lack of access.

5.166 Much of the negative impact on birds will be 'invisible' due to a decrease in breeding numbers near roads. A 5-year research programme at Harvard University (Forman *et al.* 2002) concluded that birds might be strongly affected by traffic volume or changes in volume. With traffic of 15,000–30,000 cars per day (a two-lane highway), both bird presence and breeding were decreased for a distance of 700 m. A heavy traffic volume of $\geq 30,000$ vehicles / day saw bird presence and breeding reduced for a distance of 1200 m from a road.

5.167 The Mid Arun Valley is part of a corridor from the coast and along the Arun into mid Sussex to areas such as Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks. These form the Arun Valley Special Protection Area (for rare and threatened birds) with very high numbers of over-wintering waterfowl. All these species have been recorded in the Mid Arun Valley area (Thompson 2016) and the impact of increased infrastructure in this area would be difficult to quantify.

5.168 The bird diversity and the number of birds in the Mid Arun Valley area is at least of Regional Importance and could well be of National Importance, particularly if considered with the 'green corridor' of wetland and wildfowl species.

Dormouse

5.169 Dormice are known to be breeding throughout the Binsted Woods Complex with Figure 17 showing that two locations included in the National Dormouse Monitoring Programme are adjacent to Option 3. The population is considered to be key to the surrounding areas and of Regional Importance.

Figure 17: Known breeding locations for Dormice in the Binsted Woods Complex



5.170 It is been demonstrated by James Burford (2016), using a habitat suitability index for this species, that Dormice are likely to be throughout the entire woodland block with the exception of one area. Option 3 will have a high negative impact by dividing one of the largest, uninterrupted blocks of Dormouse breeding habitat into two.

5.171 Option 3 will isolate Dormouse populations to the east of the proposed Option 3 that will be unable to disperse further than the existing A27 to the north and the River Arun to the east.

5.172 Option 3 will sever corridors that allow this species to disperse from a sizable breeding and important core population in the eastern side of the Binsted Woods Complex to smaller woodlands, copses, shaws and outgrown hedgerows within the Mid Arun Valley and beyond.

Great Crested Newt

5.173 Option 3 will sever potential hibernating and foraging sites from potential breeding sites for Great Crested Newt.

5.174 Option 3 is likely to have an indirect impact by altering the hydrology and possibly the existence of ponds in the area that are suitable for this species such as the Madonna Pond.

Otter

5.175 Option 3, by severing the network of watercourses feeding suitable Otter habitat, is likely to have a negative impact upon these sites.

5.176 This will have a negative impact on Otters in the area, as there are so few undisturbed and suitable potential nesting sites for this species in this part of the county.

Reptiles

5.177 The mosaic of habitats found in the Mid Arun Valley is ideal for reptiles and therefore the populations of all four species in the area is believed to be extremely high and of Regional Importance.

5.178 It has been mentioned that Grass Snake and Adder routinely move across large areas of the landscape in order to access suitable breeding, foraging and hibernation sites.

5.179 It is likely that all four reptiles in the area are present in the pathway of Option 3, although this route Option is likely to have a higher negative impact on Adder, which is the least common of these reptiles.

5.180 Adders are routinely seen in woodland clearings and in the north of the area, approximately where the junction and roundabout are planned.

5.181 Reptiles will move through and inhabit the more open areas of the woodland such as glades, wayleaves and footpaths, of which Option 3 severs several. The standard mitigation procedure of reptile removal and temporary exclusion fencing will not solve the longer-term issue of reptiles moving across the landscape.

5.182 Without barriers along the proposed road, there would be an unacceptable level of road deaths due to habitat severance.

Water Vole

5.183 Please refer to Paragraphs 5.89 – 5.93 as the general impacts are similar, though without the potential impact upon the Binsted Rife Valley wetland habitat.

UKBAP priority species / SPI Brown Hare

5.184 Option 3 is likely to have an adverse impact on the known population of Brown Hare in the area due to high road mortality and habitat fragmentation.

UKBAP priority species / SPI Common Toad

5.185 The Common Toad population is known to be high in the Mid Arun Valley with the main locations shown in Figure 18. An important breeding area comprising ponds and ditches is circled in yellow and a potential breeding area in white. The large star is where numerous Toads

are routinely recorded in a wet flush in woodland (Noor Wood) and the smaller star is another record.

5.186 The main block of woodland has a number of wet flushes, streams and ditches throughout which have not been investigated for Common Toad. Even if not breeding in these locations, these areas provide ideal terrestrial habitat.

Figure 18: Common Toad locations



5.187 Common Toad habitually migrates to ancestral breeding ponds each year. They follow the same route, regardless of what gets in their way, which would lead to potentially high fatalities on the proposed road thereby impacting on the local population year on year.

5.188 Option 3 will have a high adverse impact upon Common Toad by cutting across the watercourses that feed into two major known breeding areas – the Madonna Pond and Tortington Rife.

5.189 Option 3 will have a high adverse impact on Common Toad by creating a barrier between the woodland and known breeding sites. It will also sever corridors from the woodland to ponds in Tortington, which may also support breeding Common Toad.

5.190 Severance of good terrestrial woodland habitat and dispersal corridors from breeding sites is likely to result in high fatalities. This is likely to have a high adverse impact on the Mid Arun Valley population of Common Toad.

5.191 Mitigation would be dependent upon the location and number of Common Toad breeding sites and the way in which they utilize the landscape. Underpasses / bridges would be required in

order to facilitate access to ancestral breeding sites. Additionally the creation of breeding sites to replace those lost would also be required.

- 5.192 However, it is still likely that without barriers, high numbers of Common Toad would be killed on the proposed road.

UKBAP priority species / SPI European Eel

- 5.193 Please see Paragraphs 5.104 – 5.106.

UKBAP priority species / SPI European Hedgehog

- 5.194 The population density of Hedgehogs is unknown in the Mid Arun Valley. However, due to the continuing decline of this species, it is considered that the Mid Arun Valley offers an uninterrupted landscape for Hedgehogs to persist. The population is therefore considered to be of Regional Importance.

- 5.195 It is likely that the Binsted Woods Complex holds the highest population of Hedgehogs in the Mid Arun Valley area and that Option 3 would pose a significant barrier to dispersal through the woodland.

- 5.196 Option 3 is likely to result in high mortality of this species without permanent barriers to stop Hedgehogs, which are known to travel up to 2 km per night, from wondering onto the road.

UKBAP priority species / SPI – Harvest Mouse

- 5.197 It is possible that Harvest Mouse is in the dense reedbed vegetation along the Arun as there are corridors for dispersal comprising field margins and ribbons of reedbed through the entire area.

- 5.198 Option 3 is likely to impact upon watercourses that contribute to a known area of Harvest Mouse habitat (Paragraph 5.109, Figure 13) and sever potential dispersal corridors through the Binsted Woods Complex.

Invertebrates

- 5.199 The invertebrate diversity is high across the areas of the landscape surveyed to date and considered to be, collectively of Regional, if not National importance.

- 5.200 The locations of the beetle survey that found 400 species belonging to 46 families is shown in Figure 19. It can be seen that just five locations within the woodland complex delivered this high diversity.

- 5.201 Grove, in her 2006 report concluded thus ‘I particularly remember one day, working at Old Scotland Lane, when every time the sun came out, the scene came to life. Orange Pearl-bordered Butterflies appeared as if from nowhere and flew in drifts up and down the track, White Admirals flitted along the trees, a large dragonfly hunted along the path and black and yellow longhorns were among the myriad of other insects enjoying the sudden warmth. Yet, for the most part, these woods are deserted, their great diversity of insects unknown and unappreciated.’

Figure 19: Locations of a 2006 beetle survey in the Binsted Woods Complex



- 5.202 Old Scotland Lane is indeed rich in butterflies for White Admirals (UK BAP / S41 species) and Silver-washed Fritillaries are frequently seen together with possible (though not confirmed and therefore not included in records) Pearl-bordered Fritillaries (UK BAP / S41 species) and occasionally Purple Emperors (Red List NT).
- 5.203 Option 3 would result in a significant loss of woodland that would have a direct negative impact on this diversity.
- 5.204 Option 3 may also interfere with the ability of species to the east of the potential carriageway to disperse through the woodland and ultimately along habitat corridors.
- 5.118 There are many hidden impacts for invertebrates such roads forming barriers to dispersal and causing high direct mortality found in dragonflies by Soluk *et al.* 2011. Other problems highlighted in a *Buglife* report include attraction to artificial lights, ovipositing on artificial surfaces, disruption to feeding, disruption to breeding and disruption to moving across the landscape (Bruce-White and Shardlow 2011).
- 5.119 Such factors have contributed to the widespread decline of key groups such as dragonflies and damselflies, butterflies and moths and cannot be mitigated for. Their decline will have knock-on effects on the birds, bats and mammals, which depend on them for food, and is a reflection of the continuing and widespread degradation of our environment.

OPTION 1 - HABITATS

Ancient semi-natural woodland

- 5.205 Option 1 will require road widening along part of the Rewell Wood Complex LWS to the west of the roundabout. It may also take from the Binsted Woods Complex to the south of the road and an additional small fragment of woodland.
- 5.206 Option 1 will result in the loss of approximately 5.5 ha of mixed deciduous Ancient Woodland. It will take 'edge' woodland and woodland that is currently a short distance from the edge will become 'edge'.
- 5.207 Woodland edge can have an extremely high diversity of species due to higher light levels and a mixture of woodland plants and plants from additional habitats, though it is not likely to support any rare or notable species.
- 5.208 Option 1 is unlikely to negatively impact upon this 'edge' diversity, as it will readily re-establish. However, the internal areas of woodland that will become 'edge' will require survey in order to establish whether they support rare and threatened species.

Hedgerows

- 5.209 Hedgerows are S41 Habitats of Principal Importance. Option 1 would result in the loss of very scrubby and gappy hedgerows along the current A27 and the loss of five short gappy hedgerows across the floodplain.
- 5.210 The hedgerows are unlikely to be species rich and will, in places, provide habitat for breeding birds.

Notable and veteran trees

- 5.211 Ancient, veteran and notable trees are a feature of the Mid Arun Valley landscape and are throughout the area, particularly in the woodlands and shaws.
- 5.212 There may be some notable and veteran trees along the edge of the Rewell Wood Complex, though this has not been investigated.

Ponds

- 5.213 The aerial maps show a depression in one of the floodplain fields that Option 1 would pass through. This may be an ephemeral pond or a scrape.
- 5.214 Ephemeral ponds and scrapes do not support the same diversity of plant and invertebrate species as permanent ponds and therefore would not be classified as a S41 HPI. However, they do serve a purpose for some invertebrates and are important to birds.
- 5.215 Ephemeral ponds and scrapes are habitats that can readily be created in damper depressions of floodplain fields.

Reedbed

- 5.216 Most of the ditches that Option 1 will sever have become invaded by scrub along the margins. However, there appear to be some areas of reedbed that will be severed by the road.
- 5.217 These appear relatively small in extent though they may serve as corridors across the floodplain.

Floodplain grazing marsh

- 5.218 The floodplain grazing marsh (S41 Habitat) is part of a corridor from the coast and along the Arun into mid Sussex to areas such as the Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks.
- 5.219 This habitat comprises grassland interspersed with wet drainage ditches and it is usually the case that the drainage ditches hold the botanical interest forming ribbons of floristic diversity through the grassland. The extent of the wet drainage ditches in this part of the floodplain is unknown.
- 5.220 Option 1 will cause a direct loss of this habitat and present a barrier across the floodplain grassland and associated drainage ditches with implications as to the viability of protected species in the area.
- 5.221 This habitat is important for protected species such as wading birds, Water Vole and possibly Otter.

River corridor

- 5.222 Option 1 involves the widening of the current bridge, which will result in an additional small area of river corridor habitat being lost with the possible loss of rare plants.

OPTION 1 SPECIES

Badger

- 5.223 Badger activity is abundant to the south of the A27 in the woodland and farmland and it may be so to the north.
- 5.224 Badgers will build setts along road edges in banks, and so if this were the case any setts would require replacing.
- 5.225 It is unlikely that Badgers would venture across the A27 to forage with ample foraging habitat on each side of the road, and so it is highly unlikely that Option 1 would provide a barrier across territories. However, it is likely that there will be a loss of foraging habitat.

Bats

- 5.226 Bats are abundant in both the Binsted Woods Complex and the Rewell Woods Complex, yet it is currently unknown whether there is movement between these two areas of woodland.
-

- 5.227 A Barbastelle breeding colony is in Rewell Woods, and this species has been recorded roosting in the Binsted Woods Complex. If exchange were to occur between the roosts, it is likely that bats would cross the current A27 at its narrowest point with the most canopy cover.
- 5.228 To ascertain whether this is the case and there is intermixing of Barbastelles between the two woodlands, surveys would be required to establish flight lines and crossing points so that suitable mitigation could be implemented.

Birds

- 5.229 Option 1 is likely to have an adverse impact on woodland birds and wetland and wildfowl species with some loss of nesting habitat for passerines along scrubby edge habitat and a barrier across the floodplain.
- 5.230 It may particularly reduce the number of birds found foraging in the area to the north east of the road across the floodplain due to the proximity of two roads, and would certainly have an impact upon any birds breeding in this area (Forman *et al.* 2002).
- 5.231 Option 1, as with all the road Options, may have a negative impact on the Mid Arun Valley as part of an integrated corridor for birds from the coast and along the Arun into mid Sussex to areas such as Pulborough Brooks, Amberley Wildbrooks and Waltham Brooks. All the birds in these areas have been recorded, at some point, in the Mid Arun Valley area (Thompson 2016) and the impact of the increased infrastructure would be difficult to quantify.
- 5.232 The bird diversity and the number of birds in the Mid Arun Valley area is at least of Regional Importance and could well be of National Importance, particularly if considered with the 'green corridor' of wetland and wildfowl species.
- 5.233 Mitigation for birds is usually concerned with the immediate destruction of breeding habitats and the creation of nesting sites for the more widespread species. It does not take the wider issues into account.

Dormouse

- 5.234 Dormice are known to be breeding throughout the Binsted Woods Complex and the Rewell Woods Complex.
- 5.235 It is possible that the removal of some of the woodland will result in the removal of Dormouse breeding habitat.
- 5.236 It is unlikely, however, that this woodland removal will have any impact on dispersing Dormice or corridors for dispersal, as the current A27 already forms a barrier to movement for this species.

Great Crested Newt

- 5.237 Great Crested Newt do not usually breed in ditches, however, there is the possibility that they may use the slightly wider ditches to the south of the roundabout.

5.238 If this were the case then Option 1 would effectively isolate this breeding habitat from the currently accessible terrestrial habitat to the south and west.

Otter

5.239 The habitat in the vicinity of Option 1 to the east of the Arun is unsuitable for Otter. However, the widening of the bridge across the Arun may cause some temporary short-term disruption to this species, if in the area.

Reptiles

5.240 The south-facing road banks and the edge habitat along the road corridor are suitable for reptiles, particularly Slow Worm and Common Lizard, providing grassland for foraging and scrub cover.

5.241 The ditch network corridor is also suitable these two species, if there is sufficient fringing cover, and may support Grass Snake as well.

5.242 Option 1 would have a significant impact on Grass Snake if present and left in the 'island' of floodplain habitat sandwiched between two roads (the current A27 and Option 1) as this species disperses several kilometres between suitable breeding, foraging and hibernation habitats, and this would not be possible.

5.243 Grass Snake readily move in water, though it is debatable whether this species would use culverts of the length that would be required to cross a four-lane carriageway plus embankments. The culvert would have a very cool microclimate that would not be suitable for Grass Snake.

5.244 Option 1 is likely to isolate populations of less mobile reptiles between two roads, but unlikely to have a significant impact upon reptile movement across the landscape as there is already a barrier to dispersal in the form of the current A27 for north-south movement. However, whilst presently there may be very occasional movement, this will not be possible in the future without mitigation in the form of crossings.

Water Vole

5.245 The area of floodplain to be impacted upon lacks wide margins of reedbed and other areas that provide a more complex habitat required in order that Water Vole can successfully evade Mink predation. However, the area is suitable for dispersal to find good habitat along the Arun corridor.

5.246 The current bypass has several culverts through which Water Voles can potentially traverse. However, these also serve as 'pinch points' where Water Vole may be open to higher levels of predation. The proposed road would provide another set of pinch points with a relatively small area of floodplain grassland sandwiched between two roads. This is likely to increase predation and decrease dispersal to negligible levels.

UKBAP priority species / SPI Brown Hare

5.247 Option 1 is likely to have an adverse impact on the known population of Brown Hare in the area due to high road mortality and habitat fragmentation.

UKBAP priority species / SPI Common Toad

5.248 The Common Toad population is known to be high in the Mid Arun Valley to the west of the river but the population to the east is unknown. Drainage ditches generally provide suitable breeding habitat and so it is likely that this species is present.

5.249 Option 1 will sever connections between possible breeding sites and suitable terrestrial habitat for Common Toad. Option 1 will also lessen the ability for this species to disperse along the Arun Valley.

UKBAP priority species / SPI European Eel

5.250 Please see Paragraphs 5.104 - 5.106.

UKBAP priority species / SPI European Hedgehog

5.251 Hedgehogs are likely to be present along the scrubby 'edge' habitat alongside the current A27 and possibly may use scrubby corridors along the floodplain grassland for foraging.

5.252 Option 1 may result in an increase in road mortality, particularly if Hedgehogs are in the area of new road construction across the floodplain grassland.

UKBAP priority species / SPI – Harvest Mouse

5.253 It is possible, though unlikely, that this species is in along this part of the floodplain grassland due to the lack of good quality reedbed and ditch edge vegetation.

5.254 It is possible, though unlikely, that Harvest Mouse is in the tall grassland found along some of the existing road edges.

Invertebrates

5.255 The invertebrate diversity is high across the areas of the landscape surveyed to date and considered to be, collectively of Regional, if not National importance.

5.256 The current A27 road verges have a high diversity of shrubs, flowering plants and grasses, with differences in height and aspect forming a gradation of microclimates. These areas are therefore likely to support a high invertebrate diversity. However, although high in diversity this habitat is not likely to have high numbers of notable species.

5.257 Both the Binsted Woods Complex and the Rewell Woods Complex are high in invertebrate diversity. It is possible that the removal of some of the woodland may remove some the habitat for some species, but unlikely that it would destroy an area of 'entire' habitat for a given species.

5.258 The wet ditches in the floodplain grassland have the highest potential to support rare invertebrate species which may be aquatic or semi-aquatic and include molluscs and

dragonflies / damselflies. Although Option 1 will not destroy these habitats entirely, it may degrade them.

5.120 There are many hidden impacts for invertebrates such roads forming barriers to dispersal and causing high direct mortality found in dragonflies by Soluk *et al.* 2011. Other problems highlighted in a *Buglife* report include attraction to artificial lights, ovipositing on artificial surfaces, disruption to feeding, disruption to breeding and disruption to moving across the landscape (Bruce-White and Shardlow 2011).

5.121 Such factors have contributed to the widespread decline of key groups such as dragonflies and damselflies, butterflies and moths and cannot be mitigated for. Their decline will have knock-on effects on the birds, bats and mammals, which depend on them for food, and is a reflection of the continuing and widespread degradation of our environment.

6 CONCLUSIONS

A SUMMARY

- 6.1 Surveys within the Mid Arun Valley over the past two years have shown the area to support an exceptional number of S41 Habitats and Species of Principal Importance for the conservation of biodiversity. A summary of the site attributes is as follows:
- A total of 14 S41 Habitats, which cover the majority of the area.
 - An assemblage of bats that is likely to be of National Importance.
 - An assemblage of invertebrates that could be of National Importance.
 - An assemblage of birds that could be of National Importance.
 - Known high populations of protected species that are likely to be of Regional Importance such as Dormouse, Harvest Mouse, Common Toad, Grass Snake, Common Lizard, Slow Worm and Adder.
 - Populations (extent unknown) of species also likely to be of Regional Importance such as Water Vole, Brown Hare, European Eel and Hedgehog.
 - Habitat with the potential to support Otter and Great Crested Newt.
 - A very high population of Badger, which is likely to be of Local Importance.
- 6.2 Areas such as this should be 'ring-fenced' for protection. The Mid Arun Valley does not just support populations of one or two protected species, but thriving populations of most protected species.
- 6.3 In this, it is an unusual area, for much of the British countryside is impoverished, and large areas usually support just a handful of habitats which do not include a range of S41 Habitats of Principal Importance.
- 6.4 Assemblages and habitats such that seen in the Mid Arun Valley take time to accumulate and therefore there is no appropriate mitigation or compensation for such outstanding biodiversity.

THE THREE OPTIONS

- 6.5 A summary of the three Options is given in the following tables. Table 4 summarizes the potential impacts of the three scheme Options on S41 Habitats of Principal Importance and Table 5 summarizes the potential impacts on protected and S41 species or species groups.
- 6.6 It is clear that not all the Options will present the same type or magnitude of impact, for Options 3 and 5A are entirely through unspoiled countryside and Option 1 is largely along an existing carriageway with a far smaller proportion through unspoiled countryside.

Table 4: Summary of adverse impacts of the Options on S41 habitats

Habitat	Potential loss		
	5A	3	1
Ancient woodland	6.6 ha but greater area lost / degraded / fragmented	24 ha / severe fragmentation, much degradation due to road edge	5.5 ha
Woodland	2 main areas of good quality habitat	-	A fragment
Hedgerows	8 (3 species rich / important)	5 (4 long)	5 – 7 (short)
Ancient shaws	3	-	-
Notable / veteran trees	Unknown – likely many	Unknown – likely many	Unknown
Chalk Streams – (aquifer fed water bodies)	2 streams	-	-
Streams and ditches – (possibly aquifer fed water bodies and some reedbed)	4 main streams	3 main streams	-
Ponds – spring and stream fed	3 possibly more	3 possibly more	-
Lowland fen (and swamp)	Potential loss of Binsted Rife Valley	-	-
Reedbed	Loss along river corridor and ditches and potentially in fields	Loss along river corridor and ditches	Loss along ditches
Floodplain grassland	Area lost and dissected	Area lost and dissected	Area lost and dissected
River corridor	Small area lost – new obstruction	Small area lost –new obstruction	Small area lost

Table 5: Summary of adverse impacts of the Options on protected species

Species	Importance	Negative impact (includes breeding / dispersal)		
		5A	3	1
Badger	Local	High	Medium	Medium
Bats	Regional / National	High	High	Low / medium
Birds	Regional / National	High	High	Medium
Dormouse	Regional	High	High	Low
Reptiles	Regional	High	Medium / high	Medium
Water Vole	Regional	High	High	High
Common Toad	Regional	High	Medium / high	Medium
Brown Hare	Regional	High	High	Low / medium
European Eel	Regional	High	High	High
Hedgehog	Regional	High	High	Medium
Harvest Mouse	Regional	High	Medium	Low / medium
Invertebrates	Regional / National	High	High (some groups)	Low

Ancient woodland and woodland

- 6.7 Option 3 destroys an extremely large area of irreplaceable ancient woodland, and will possibly degrade an additional large area (along the sides of a new carriageway). It fragments the largest remaining block of woodland on the West Sussex coastal plain.
- 6.8 Although Option 5A destroys less woodland, it will degrade an important area of wet woodland and leave much smaller fragments that are likely to lose species and long term viability due to fragmentation.
- 6.9 Option 1 will destroy the lowest amount of woodland and it will not result in fragmentation of woodland habitat.

Streams and ponds

- 6.10 Option 5A is likely to destroy or severely degrade two chalk streams and the associated habitat, which is extremely rich and diverse along the Binsted Rife Valley.
- 6.11 Option 5A and Option 3 will destroy or severely degrade a stream and ditch network, which shapes many of the habitats and much of the diversity (across all groups), through much of the area.
- 6.12 Option 1 will not impact upon this network.

Habitat corridors

- 6.13 Option 5A severs all the major terrestrial corridors from the Binsted Woods Complex (eleven in total), which, in effect will isolate the woodland creating an 'island'.
- 6.14 Option 3, by dividing the woodland decreases the number of species that will be able to access these corridors and cuts off the remaining habitat corridors from the block of woodland to the east. Both these Options will have significant impacts on species movement.
- 6.15 Option 1 follows an existing barrier through woodland and so the impact is going to be far lower for species that may disperse from woodland on a diurnal or seasonal basis.
- 6.16 All three Options present a significant barrier across the floodplain grassland, which will negatively impact upon the habitat, the north-south movement for some groups, and species distributions.

Habitat fragmentation

- 6.17 Option 5A will produce two fragmented areas of woodland that cannot be easily linked due to the position of the carriageway. Option 3 will fragment a hugely viable large woodland block into two.
- 6.18 Option 1 would leave a fragment of floodplain grassland isolated between two roads, whereas Options 3 and 5A would leave a slightly larger area of floodplain between two roads.

- 6.19 Fragmented populations are exposed to all the problems associated with isolation: genetic deterioration from inbreeding and random drift in gene frequencies, environmental catastrophes, fluctuations in habitat conditions, and demographic stochasticity (i.e., chance variation in age and sex ratios).
- 6.20 Populations living in smaller fragments have a higher probability of becoming extinct, and once that local extinction has taken place, without usable habitat corridors, the extinct population is unlikely to be replaced.
- 6.21 The Dormouse monitoring in the Binsted Woods complex has recorded great variations in the numbers of Dormice recorded year on year, making it clear to see how easily the populations in newly fragmented areas of woodland could become extinct.
- 6.22 Moreover, as the corridors from the large, stable and likely 'source' population of Dormice in the Binsted Woods Complex are severed, other populations that may be in smaller copses, hedgerows and plantation woodlands in the area may not be replaced should extinction occur. This scenario may be played out by many species.

MITIGATION

Direct habitat loss

- 6.23 Mitigation measures usually consider the direct loss of habitat that would disappear beneath a given feature i.e. direct habitat loss. In this instance there are a number of indirect impacts and impacts that will not be realised until the longer term as follows:
- The quality of the habitat such as the wet seepage woodland in Hundred House Copse / Little Danes Wood that would be altered / destroyed due to the road. These habitats are irreplaceable (Option 5A).
 - The division of the last remaining large block of woodland on the Sussex coastal plain (Option 3).
 - The fragmentation of woodland leaving small remnants that will gradually lose their wildlife interest and value such as Barns Copse, The Lag and The Shaw (Option 5A).
 - The severance of two chalk streams, which support rare and threatened species and are irreplaceable (Option 5A).
 - The impact upon the stream and ditch network, the ponds fed by this system, and the areas of adjacent and integrated lowland fen, reedbed, swamp and marshy grassland (Options 3 and 5A).
 - The destruction of habitat corridors seen in all Options but greater in 5A, which will ultimately impact on many species.

An integrated landscape for protected species

- 6.24 The Mid Arun Valley forms a continuation of an exceptionally diverse river corridor that is relatively uninterrupted from the middle of Sussex as far as the English Channel. It is the presence of good quality habitats, the proximity to other good quality habitats such as the Arun

Valley Special Area of Conservation, the Arundel Park SSSI and the Arundel Wildfowl and Wetlands Trust Reserve and the lack of barriers to dispersal that has resulted in the diverse range of species observed in the Mid Arun Valley area.

- 6.25 The course of the River Arun, with a margin of associated floodplain grassland, can be traced from the coast to its origin in mid Sussex with very few barriers. This, when compared to other mid-Sussex rivers such as the Adur and the Ouse, provides a corridor that is largely uninterrupted by urban areas and major road networks.
- 6.26 This uninterrupted landscape feature, that is of immense importance to wildlife, should be preserved in an area with such a high human population density.

Loss of dispersal corridors for protected species

- 6.27 There are 11 habitat corridors from the Binsted Woods Complex linking to the surrounding habitats and subsequently linking the surrounding habitats to each other and further afield. This forms an important integrated network of habitat linkages.
- 6.28 Option 3 would create a barrier across the Binsted Woods Complex and a barrier across two potential habitat corridors from the section of woodland to the east.
- 6.29 The road will from a significant barrier across the River Arun Corridor which would require culverts and bridges.
- 6.30 Mitigation will not provide crossings for all the corridors and will have a negative impact on species that rely on moving across the landscape on a seasonal or diurnal basis. Protected species that would occupy both woodland and open habitats and use these habitat linkages are as follows:
- Badger, birds and bats – move across the landscape on a daily basis for foraging.
 - Common Toad – move across the landscape in order to access ponds to breed and then spend most of their life cycle terrestrially in damp grassland, woodland, shaws and copses.
 - Reptiles, particularly Adder and Grass Snake, move several kilometres across a given landscape from hibernation sites to breeding and foraging grounds.
 - Hedgehogs routinely travel up to 2 km per night to forage.
 - Dormice will use the corridors primarily for dispersal to find new areas of habitat.
 - Water Voles are largely restricted to the use of ‘wet’ corridors across the landscape.
 - Invertebrates follow corridors in order to disperse and to search for food plants.

- 6.31 Mitigation does not compensate for habitat fragmentation, and even when green bridges and culverts are constructed there is little evidence that these are compensatory.

- 6.32 Ree *et al.* 2007 reviewed 123 papers on the effectiveness of mitigation methods for animals crossing roads. Most studies demonstrated that most measures designed to increase the permeability of roads for wildlife were successful at the level of the individual animal (i.e. an animal was found using it).

- 6.33 However, the extent to which the population benefits from a successful crossing is unclear. They say that there is insufficient information and analysis in the majority of studies to evaluate whether these structures increase the viability of the population to an acceptable level.
- 6.34 The problems with habitat fragmentation and the importance of habitat connectivity and corridors has increasingly been a focus for planning and action, culminating in the national 'Making Space for Nature' Lawton report (2010).
- 6.35 During the launch of this report Professor Lawton said "There is compelling evidence that England's collection of wildlife sites are generally too small and too isolated, leading to declines in many of England's characteristic species. With climate change, the situation is likely to get worse".
- 6.36 "This is bad news for wildlife but also bad news for us, because the damage to nature also means our natural environment is less able to provide the many services upon which we depend. We need more space for nature".
- 6.37 The 2010 Lawton report promotes four essential principles for future nature conservation in the UK: bigger, better, more, and joined-up.
- 6.38 Local populations of a given species will be scattered across the Mid Arun Valley and beyond. At some locations and may become extinct for a number of reasons such as localised flooding, drying, freezing, predation etc.
- 6.39 Many species have very limited dispersal abilities and so without the ability to move about the landscape and recolonize such areas, populations would disappear from these patches and eventually from the larger area. Landscape scale extinction would then occur.
- 6.40 The interruption of these large and secure populations in the Mid Arun Valley is likely to have very real cumulative impacts on regional populations. The area will likely become impoverished in comparison to its current status.

PLANNING POLICY

- 6.41 Planning Policy Statement 9 (PPS9): Biodiversity and Geological Conservation (ODPM, 2005) states that:

The aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests, which cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.

- 6.42 There are five Section 41 Habitats of Principal Importance that cannot be replaced; ancient deciduous woodland, wet woodland, chalk streams, stream fed / spring fed ponds and lowland fen. In addition, the veteran trees will take 100's of years to replace and so should be deemed irreplaceable.
- 6.43 Some of these habitats found within the Mid Arun Valley are quite unique to the area such as seepage wet woodland, spring fed ponds, chalk streams and lowland fen contributing disproportionately to the unique biodiversity of the area.
- 6.44 Under PPS9, Local Planning Authorities have the following responsibility
- ‘to ensure that Internationally, Nationally, Regionally and Locally Important Sites, Ancient Woodlands, other Important Natural Habitats and Networks of These Habitats are not lost or degraded as a result of development unless the need for and benefits of the development outweigh the impacts that it is likely to have. Local Planning Authorities should use conditions and/or planning obligations to mitigate harm and ensure conservation/enhancement of the site's biological or geological interest’.
- 6.45 Minimal surveys (with the exception of invertebrates) over the last two years have shown that the area is incredibly diverse and has concluded that it is possibly of Regional Importance and likely holds Nationally Important groups of certain species.
- 6.46 This survey and a consideration of the requirements of protected species has shown that mitigation will not be possible for all groups and that Options 3 and 5A cannot be achieved without a severe negative impact upon this biodiversity.
- 6.47 Widening of the existing carriageway will have notably less impact than one of the ‘green’ routes (i.e. a route that traverses unspoilt countryside). The road is already in place and has been for some time. It will require the following:
- Felling of fewer trees and those that would require felling are along the edge of the road and therefore do not generally constitute good quality habitat.
 - Less land grab – much of which would be existing road verges and poorer quality habitat.
 - Less severance of habitat and habitat corridors / flight lines.
 - The loss of irreplaceable habitat would be restricted to the edge of ancient woodland and possibly some veteran trees.
 - The Binsted Woods Complex LWS would remain the biggest block of woodland to the south of the A27 and would be able to function in an integrated way with its surrounding habitat.
- 6.48 All the Options will have considerable negative impacts, however, the online Option is ecologically by far the least damaging option, and planners are legally obliged to take this into account when making their decisions.

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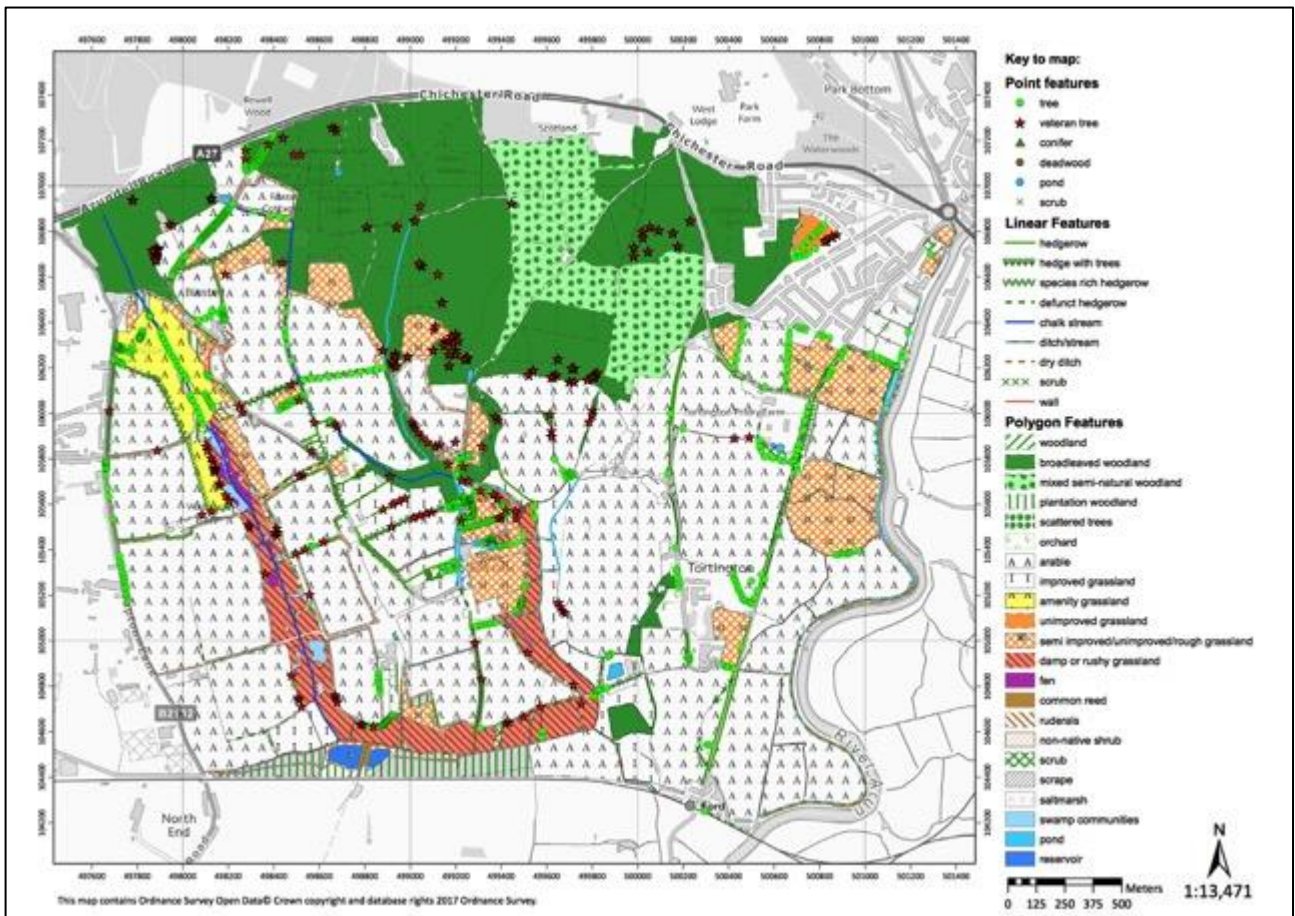
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APPENDIX 1 – PHASE 1 HABITAT MAP



APPENDIX 2 – PRIORITY HABITATS

Habitat	Description
Arable field margins	The field margin is the area between the crop and the field boundary providing a vital haven for the many farmland species that have declined over recent years due to agricultural intensification. Tall vegetation offers cover for a range of species such as small mammals and birds, and the flowering plants provide a nectar source for a range of invertebrates.
Chalk stream	A chalk river or stream is a watercourse that flows across chalk bedrock, and/or is influenced by local chalk geology. All chalk rivers are fed from groundwater aquifers, which means they have clean, clear water and relatively stable water temperatures. These unique conditions support a rich diversity of wildlife including important fish populations such as Brown Trout, native Crayfish and many other specialist species. Binsted Rife is a chalk stream.
Coastal and floodplain grazing marsh	Grazing marsh is periodically inundated pasture, with ditches that maintain the water levels, containing standing brackish or fresh water. Sites may contain seasonal water-filled hollows and permanent ponds with emergent swamp communities. This habitat is important for wading birds and the drainage ditches support a wide range of flowering plants and invertebrates as well as a number of fish species. Mammals such as Water Vole and Otter may use the ditches. The aims of the Sussex Biodiversity Action Plan for this habitat include maintaining the condition and the extent of the existing resources of coastal and floodplain grazing marsh in Sussex with no net loss.
Lowland fen	Lowland fens are permanently waterlogged wetlands, which receive water and nutrients from soil, rock and groundwater as well as rainfall. This habitat supports a wide diversity of flowering plants and associated invertebrates, as seen along Binsted Rife. It has declined dramatically.
Hedgerows	The UK Biodiversity Action Plan (2007) defines a hedgerow as any boundary line of trees or shrubs over 20 m long and less than 5 m wide, and where any gaps between the trees or shrub species are less than 20 m wide. All hedgerows consisting predominantly (i.e. 80 % or more cover) of at least one woody UK native species are included in this Section 41 Habitat. Specific aims for S41 Habitat include maintaining the net extent of hedgerows and the numbers of hedgerow trees.
Lowland mixed deciduous woodland	Lowland mixed deciduous woodland now only covers 1-2 % of its original range and has declined by around 40 % since 1935. These woodlands are home to almost half of the world's Bluebells and are important for wide range of birds including Nightingales and Spotted Flycatchers as well as hibernating amphibians and reptiles. It is also the main stronghold of the protected Dormouse, once widespread, but now extinct from around half of its former haunts. Sussex is one of the most wooded parts of lowland Britain with ancient woodland covering approximately 10 % of the county. Much of this woodland is ancient in origin with a continuous woodland cover since at least 1600 AD. Such woodland has a wealth of features of historical and archaeological importance little altered by modern cultivation or disturbance. The soils retain their ancient features such as mycorrhizal fungi and the diversity of fungi, bryophytes, plants and invertebrates can be exceptionally rich. The BAP mainly focuses on the protection, expansion and restoration of woodlands in Sussex.

Habitat	Description
Wet woodland	Wet woodland combines elements of many other ecosystems and as such is important for many taxa. The high humidity favours bryophyte growth. The number of invertebrates associated with Alder, birch and willows, is very large. Even quite small seepages may support craneflies such as <i>Lipsothrix errans</i> and the endemic <i>Lipsothrix nervosa</i> . Wet woodland provides cover and breeding sites for otters <i>Lutra lutra</i> .
Lowland heathland	Heathland is a largely open landscape occurring on impoverished, acidic soils and is often a mosaic of bare ground, acid grassland, gorse, bracken, bog and scattered trees. A diversity of invertebrates is found with rare species including wasps, beetles and spiders. Several uncommon birds thrive on heathland including Nightjar and Stonechat.
Lowland Meadow	Unimproved neutral grassland, including hay meadows, known under the National Vegetation Classification system as MG5 grassland, was once the ubiquitous type of old meadow and pasture in the English lowlands. Since the late 1960's it has sustained large losses due to drainage, ploughing and re-seeding and from the use of high rates of fertilisers. There is now less than 6,000 ha remaining in England. The fields at Steward's Copse are this NVC type.
Ponds	Ponds are important because they have declined in number, and yet they are home to over 1000 native species. Priority ponds are those that have habitats or species of high conservation importance, or they may be recognised for their age, rarity or type.
Reedbed	Reedbeds are amongst the most important habitats for birds in the UK. They support a distinctive breeding bird assemblage including 6 nationally rare Red List Birds including Bittern, Marsh Harrier, Cetti's Warbler and Bearded Tit. They provide roosting and feeding sites for migratory species and are used as roost sites for several raptor species in winter. Five GB Red Data Book invertebrates are also closely associated with reedbeds including Red Leopard Moth <i>Phragmataecia castanaea</i> and a rove beetle <i>Lathrobium rufipenne</i> .
Saltmarsh	Saltmarsh vegetation consists of a limited number of halophytic (salt tolerant) species adapted to regular immersion by the tides. Saltmarsh constitutes an important resource for wading birds and wildfowl.
Traditional orchard	Traditional orchards are areas of land on which a range of fruit trees are managed in a low intensity way. The bark is suitable for a wide range of bryophytes and lichens and the dead and decaying wood is important for invertebrates and fungi. Holes and crevices in old trees provide habitat for bats and nest sites for birds such as Redstart and Bullfinch.
Wood pasture and parkland / veteran trees	Many parks were established in medieval times for aesthetic reasons, to provide grazing for farm animals or deer and to provide wood from pollarded trees. In later centuries, new landscaped parks were created from these medieval parks or by enclosing ordinary farmland. Typically wood pasture consists of veteran trees with wide, spreading crowns growing in a matrix of grazed grassland. The trees have often been pollarded; this management technique extends their life and creates rot holes and crevices, which are used by bats, hole-nesting birds and invertebrates. Rotten wood within ancient tree trunks supports saproxylic invertebrates (those that rely on dead wood for all or part of their life cycle) and are amongst the most threatened group of species in Europe.

APPENDIX 3 – WILDLIFE POLICY

The Wildlife and Countryside Act 1981 (as amended)

Schedule 1

Applies to all wild birds where it is an offence:

- to take, damage or destroy a nest whilst it is being built or in use
- to kill, injure or take any wild bird (subject to certain exceptions)
- to take or destroy the egg of any wild bird.

It is also an offence to disturb any wild bird listed on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended)

- while it is nest building
- at a nest containing eggs or young
- to disturb the dependant young of any such bird.

Schedule 5

For animals fully protected under Schedule 5 which includes, the hazel dormouse, great crested newt, all bats, water voles, otters, smooth snake, sand lizard and natterjack toad. It is an offence:

- to intentionally kill or injure or take these species
- to intentionally or recklessly damage or destroy or obstruct access to any structure or place which a species uses for shelter or protection, at any time even if the animal is not present.
- to intentionally or recklessly disturb whilst it is occupying a place which it uses for shelter or protection.

Adder, grass snake, common lizard and slow worm are protected from being killed or injured and the white-clawed crayfish is protected from being taken.

Schedule 8

Specific species of plants listed in Schedule 8 are protected. It is an offence: to intentionally pick, uproot or destroy a wild plant listed in Schedule 8.

Schedule 9

Invasive non-native species are listed under Schedule 9. It is an offence:

- to plant or otherwise cause to grow in the wild.
- If soils are contaminated by invasive non native plant species it becomes classified as
- 'controlled waste' under the Environmental Protection Act 1990 (England, Wales & Scotland),
- and must be disposed of accordingly.

The Conservation of Habitat and Species Regulations 2010

Schedule 2 applies to all European Protected Species (EPS) which included all bat species, great crested newts, dormice, otters, sand lizards, smooth snake and natterjack toad. The protection afforded is overlapping but separate from the Wildlife and Countryside Act 1981 (as amended)

The Protection of Badgers Act 1992

Under this Act it is an offence to intentionally or recklessly interfere with a badger sett by:

- a) damaging a sett or any part of one
- b) destroying a sett
- c) obstructing access to any entrance of a sett
- d) disturbing a badger when occupying a sett

Where interference with a badger sett cannot be avoided during development, a licence from Natural England should be applied for.

The Natural Environment and Rural Communities Act 2006 and The Biodiversity Duty

The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 40 of the Act requires all public bodies to have regard to biodiversity conservation when carrying out their functions. This is commonly referred to as the 'biodiversity duty'.

Section 41 of the Act requires the Secretary of State to publish a list of habitats and species which are of 'principal importance for the conservation of biodiversity.' This list is intended to assist decision makers such as public bodies in implementing their duty under Section 40 of the Act. Under the Act these habitats and species are regarded as a material consideration in determining planning applications. A developer must show that their protection has been adequately addressed within a development proposal.

The UK BAP

This was published in 1994 to comply with obligations under the Convention on Biological Diversity (The Biodiversity Treaty, 1992). It described the UK's biological resources and committed to developing detailed plans to conserve these resources i.e. Habitat Action Plans and Species Action Plans. The most up to date targets and actions, including latest progress reports, for UK HAPs and SAPs can be viewed on the DEFRA website¹⁷. Running parallel to this, Local Planning Authorities (LPAs) promoted habitat and species conservation at a county and district/borough level through their development of Local BAPs (LBAPs).

Since the publication of these BAPs, new strategies and frameworks have resulted in the devolvement of biodiversity issues and changes in the terminology used to describe these habitats and species in England. This has been brought about through the replacement of the previous England Biodiversity Strategy with Biodiversity 2020: A Strategy For England's Wildlife and Ecosystem Services (2011) and the replacement of the UK BAP itself with the UK Post-2010 Biodiversity Framework (2012).

All previous UK BAP species and habitats are still of material consideration in the planning process but are now referred to as Habitats and Species of Principal Importance for the Conservation of Biodiversity in England as listed in Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. The promotion of priority habitats and species in LBAPs are also of material consideration in the planning process.

In addition to the now redundant national BAP, BAPs were also produced at the county level. The Sussex BAP is managed by the Sussex Biodiversity Partnership. The aims and objectives of the Sussex BAP are to reflect national targets for habitats and species of principal importance, translate them at a local level and to integrate the needs of species and habitats within landscape-scale delivery.

Red Data Book (RDB)

The IUCN RDB criteria reflect the level of threat of extinction that a species faces and are based on population declines (in contrast to the previous RDB criteria, which were based on restricted distribution) (Cheffings and Farrell 2005). Those species that fall into the top categories of CR (critically endangered), EN (endangered) and VU (vulnerable) all have a high risk of extinction in the wild and declining population size of >80% over last 10 years for CR, >50% for EN and >30% for VU.

National status

Species highlighted in the survey as notable species were selected because they fall into one of the following categories:

- Nationally Rare is defined as species that are found in 15 or fewer hectads.
- Nationally Scarce (also termed Nationally Notable) relates to species that occur in between 16 and 100 10km squares throughout Britain.
- Nationally Notable A are species found in 16 to 30 hectads.
- Nationally Notable B are species found in 31 to 100 hectads.
- Local is a status sometimes used for species found in 101 to 300 hectads.
- Sussex Rare Species Inventory (SxRSI) lists species that are rare in Sussex or those that are declining locally.

Birds of Conservation Concern

Every five years the population statuses of the 247 species of bird that are regularly found in the UK are reviewed. There are three lists – Red, Amber and Green - into which each species is placed. The status decisions are based on several factors which include: the species' global and European conservation status; recent and historical decline; whether it is a rare breeder; if it is only confined to a few sites in the UK; and if the species is of international importance.

- Red List species are those that are Globally Threatened according to IUCN criteria such as those whose population or range has decline rapidly in recent years.

- Amber List species are those with Unfavourable Conservation Status in Europe such as those whose population or range has declined moderately in recent years; rare breeders; and those with internationally important or localized populations.
- Green List species do not fit any of the above criteria, although some are still protected by law.

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Wildlife Splash Limited has prepared this report, with all reasonable skill, care and diligence within the terms of the Contract with the client.

Surveys and research have been conducted to the best of our ability during the given timeframe. However, no method can completely eliminate the possibility of obtaining partially imprecise or incomplete information. We disclaim any responsibility to the client and others in respect of any matters outside the reasonable scope of works.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

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Whilst the concrete front of development advances through the Sussex Countryside, members of MAVES, locals, Arundel residents and those from further afield continue to discover and document the amazing diversity of wildlife that makes the Mid Arun Valley hum with life. Without knowing what life we have we cannot fight to protect it.

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