Appendix 7-3: Arboriculture Report

A27 Arundel Bypass Arboriculture Report

Appendix 7-3 Arboriculture Report

30 August 2019

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1 Introduction

1.1.1.1 This report provides the baseline and assessment of the potential impacts associated with Arboricultural receptors arising from the Scheme. This report has been completed in accordance with guidance provided within The Design Manual for Roads and Bridges (DMRB). Volume 11: Environmental Assessment. The significance of arboricultural effects has been identified using guidance provided within Table 2.4 of DMRB Section 2, Part 5. From a professional judgement, the potential impacts considered in this report are:

- Construction phase

- Impacts resulting from fragmentation of ancient woodlands, an irreplaceable habitat.
- Impacts resulting from the permanent loss of significant areas or numbers of irreplaceable habitats (which includes ancient woodlands, ancient and veteran trees).
- The removal of a significant number of arboricultural receptors of high, medium, low and negligible sensitivity (to include other woodlands and individual trees) to facilitate construction resulting in net loss of tree canopy cover.
- Damage to soil and tree roots / canopies of retained trees within 15 metre buffer results in deterioration of condition and reduce retention span.

- Operational phase

- Residual effects resulting from loss of large areas of ancient woodlands or fragmentation of these habitats.
- Overall net loss of tree canopy cover resulting from removal of arboricultural receptors.
- Increased exposure to windthrow.
- Damaged tree roots and canopies resulting from construction phase of retained trees leading to reduced value of arboricultural receptors.
- Likely long-term impacts associated with tree pests and diseases, including Chalara dieback of ash (*Hymenoscyphus fraxineus*).
- Climate change impacts resulting in changes to future local environmental conditions.
- Regrowth of retained arboricultural receptors resulting in the encroachment of tree roots and canopy across Highways England boundary of the operational Scheme.

1.1.1.2 This report should be read in conjunction with:

- **Environmental Assessment Report (EAR) Chapter 7: Landscape and Visual**
- **EAR Chapter 8: Biodiversity**.

1.1.1.3 A glossary of terms and a list of the acronyms used in this report are provided in **Chapters 8** and **9**.

2 Legislative and Policy Framework

2.1.1.1 **Table 2-1** summarises the legislation, policy and guidance applicable to the arboriculture assessment.

Table 2-1 Legislation, policy and guidance applicable to the arboriculture assessment

Name	Summary
Directives and Legislation	
Natural Environment and Rural Communities Act 2006	Section 40 of the Natural Environment and Rural Communities Act places a duty on local authorities and government departments to have regard for the conservation of biodiversity when exercising their normal functions. Development activities must be undertaken with due regard for trees and their biodiversity value. Trees should be retained wherever practicable and opportunities taken to maintain and enhance their environmental contribution.
Town and Country Planning Act (1990)	The Town and Country Planning Act places a duty upon local planning authorities to make provision for the preservation and planting of trees when granting permission for new development. It also affords local planning authorities with the power to make Tree Preservation Orders (TPO) where trees and woodlands would be beneficial in the interests of amenity in their area.
National Policy	
National Policy Statement for National Networks[1]	The National Policy Statement for National Networks (NN NPS) at paragraph 5.32 states that development consent should not be granted for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland and the loss of aged or veteran trees found outside ancient woodland, unless the national need and benefits of the development in that location clearly outweigh the loss.
National Planning Policy	The National Planning Policy Framework (NPPF) (paragraph 170) states that planning policies and decisions should contribute to and enhance the natural and local environment and recognises the economic

[1] Department for Transport, *National Policy Statement for National Networks* (December 2014)

Name	Summary
Framework (NPPF) (2019)[2]	and other benefits that trees and woodlands provide. The NPPF at paragraph 175 requires that in determining planning applications, development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists.
Local Policy	
Arun District Local Plan 2011-2031[3]	The Arun District Local Plan 2011 – 31 replaced the 2003 Arun District Local Plan. The relevant policies included in the Local Plan include: ▪ Policy ENV DM4 states that developments that may impact on trees protected by a TPO, identified as ancient woodland, in a conservation area or contributing to local amenity should demonstrate the benefits of the proposed scheme in instances where damage or loss of trees is likely to occur. Developments that will result in the loss of trees will be required to plant an equivalent number similar species and age, with sufficient space and form an integral part of the overall design.
West Sussex Structure Plan 2001-2016[4] **(saved policies)**	The West Sussex Structure Plan 2001-2016 provides a broad planning framework for the West Sussex area. Although it does not hold any formal status in the current planning system it remains a strategic policy statement for future development and land use planning. The document acknowledges the exceptional character of West Sussex and contains a number of 'saved' strategic policies that provide for: ▪ Protecting and reinforcing the distinctiveness of the main National Character Areas (NCAs)

[2] Department for Communities and Local Government, *Revised National Planning Policy Framework* (Feb 2019)

[3] Arun District Council, The *Arun Local Plan 2011-2031* (2018) https://www.arun.gov.uk/adopted-local-plan [Accessed April 2019]

[4] West Sussex County Council, West Sussex Structure Plan 2001-16 (Feb 2005) https://www.westsussex.gov.uk/media/7125/structure_plan_05.pdf

Name	Summary
	▪ Safeguarding the Area of Outstanding Natural Beauty ▪ Protecting woodlands and forests ▪ Protecting rivers, waterways and the coast ▪ Retaining the separate identity of towns and villages.
South Downs Local Plan Adopted 2 July 2019 (2014 – 33)[5]	The South Downs National Park Authority submitted its Local Plan in April 2018. The final Inspectors Report has been received and concluded that the Local Plan is sound, subject to a number of main modifications. The National Park Authority considered and adopted the Local Plan together with the Inspector's recommended main modifications on 2 July 2019. The adopted Local Plan replaces all existing planning policies across the National Park. The relevant Local Plan policies include: ▪ Strategic Policy SD9 – this policy states that where a development proposal results in the loss or deterioration of irreplaceable habitats (including ancient woodland veteran trees) planning consent will be refused unless there are wholly exceptional reasons and a suitable compensation strategy exists. ▪ Development Management Policy SD11 – The purpose of this policy is to ensure the conservation and enhancement of existing trees, woodland and hedgerows, and to ensure that opportunities for restoration and new planting is realised. Where trees will be affected, this must be informed by a full site survey and trees to be retained are to be provided with an adequate buffer to protect root systems. Where protected trees are to be removed, a replacement of an appropriate number, species and size in an appropriate location will be required.

[5] South Downs National Park Authority, *South Downs Local Plan: Adopted 2 July 2019 (2014 – 33)* https://www.southdowns.gov.uk/planning/south-downs-local-plan_2019/local-plan/ [Accessed July 2019]

Name	Summary
Guidance	
General Principles of Environmental Assessment, Design Manual for Road and Bridges (DMRB) 2008[6]	Section 2 of the DMRB provides the general principles and guidance for undertaking environmental impact assessments. Part 5 of the DMRB describes three levels of assessment.
British Standard BS 5837 Trees in relation to design, demolition and construction – Recommendations (2012)[7]	This guidance provides information on planning for the management, protection and planning of trees. It sets out principles and procedures to be applied to achieve a harmonious and sustainable relationship between trees and structures and is applicable whether or not planning consent is required.
Ancient Woodlands, ancient trees and veteran trees: protecting them from development[8]	The Forestry Commission and Natural England published guidance on 13 October 2014 to provide information for the protection of ancient woodland and veteran trees from development. This guidance was subsequently updated on 5 November 2018 and advises the following: ▪ A buffer zone of semi-natural habitat should be left of at least 15 metres between any development and ancient woodland. ▪ A buffer zone should be left between any veteran, ancient or aged tree and proposed development of at least 15 times the diameter of its stem or 5m from the edge of its canopy, if that's greater.

[6] Highways Agency, Assessment and Management of Environmental Effects HA 205/08, Design Manual for Roads and Bridges Volume 11, Section 2, Part 5 (August 2008)

[7] British Standards Institute, *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*. London: BSI (2012)

[8] Forestry Commission & Natural England, *Ancient Woodlands, ancient trees and veteran trees: protecting them from development* (November 2018) https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences [Accessed April 2019]

3 Assessment Methodology

3.1 Overview of assessment methodology

3.1.1.1 The Arboriculture assessment has been prepared in accordance with the legislation and guidance provided in **Chapter 2.** The methodology used to assess the difference in baseline conditions with the Scheme in comparison to without the Scheme is set out below.

3.1.1.2 Baseline data collection has been undertaken with reference to British Standard BS 5837:2012 'Trees in relation to design, demolition and construction – Recommendations'[9].

3.1.1.3 Additional baseline data used in this report has been collected through third party data from Sussex Biological Data[10], Mid Arun Valley Ecological Survey[11] and Woodland Trust Ancient Tree Inventory[12].

3.1.1.4 Baseline data collection has been undertaken using the following data sources:

- An arboricultural desk study
- A walkover survey of all arboricultural receptors within the Study Area (see **Section 3.2**).

3.1.1.5 The findings of the collated baseline arboricultural resource can be found in **Appendix 1**.

3.1.1.6 The arboricultural assessment for construction significance of effect has then been undertaken in accordance with guidance provided within the Design Manual for Roads and Bridges, Volume 11: Environmental Assessment[13]. The construction significance of arboricultural effects has been determined using guidance provided within Table 2.4 of Section 2, Part 5 of the DMRB. The construction significance of effects is informed by the environmental values assigned to arboricultural receptors as outlined in **Table 3-1** below, versus the magnitude of impact resulting from the loss of arboricultural features as outlined in **Table 3-2**.

[9] British Standards Institute, *BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations*. London: BSI (2012)

[10] Sussex Biodiversity Record Centre, Ecological data search for land at A27 Arundel SxBRC/16/860 (March 2017)

[11] MAVES, An ecological survey of the Mid Arun Valley (2017)

[12] https://ati.woodlandtrust.org.uk/

[13] Highways Agency, Assessment and Management of Environmental Effects HA 205/08, Design

3.1.1.7 A detailed assessment of operational impacts will be assessed at PCF Stages 3 (Preliminary Design) and PCF Stage 5 (Construction Preparation), once the tree planting compensation and mitigation proposals have been finalised.

3.2 Study Area

3.2.1.1 A number of Study Areas for each Scheme option are used in this arboricultural assessment in accordance with the legislation and guidance outlined in **Chapter 2**. The Study Areas for each Scheme option comprise:

- Desk Study Area: 100 metres from the footprint of Scheme options to record TPOs, conservation areas, ancient woodland, other woodlands, ancient and veteran trees, and notable trees, see **Figure 3: Arboriculture Constraints Plan.**
- Field Study Area: 15 metres from the footprint of Scheme options for BS5837 tree survey (to take into consideration of impacts on root protection areas for trees located beyond the option footprint), and up to 100 metres for ancient woodland, ancient and veteran trees, and notable trees identified either via desk study or visually during site visit.

3.2.1.2 To assess arboricultural features at direct risk of impacts to rooting area and tree canopy resulting from construction works, each option footprint was buffered by a further 15 metres, then overlaid onto desktop and site survey data (as outlined for Field Study Area). It is noted that this approach may overestimate indirect impacts (e.g. damage to rooting area of neighbouring arboricultural features) due to the varying size of root protection areas recorded, however, it provides a consistent basis for Scheme option differentiation.

3.3 Future baseline prediction methods

3.3.1.1 It is anticipated changes to the baseline of arboricultural receptors will occur due to climate change, policy changes and future development by the year 2026 (the operational year). The future baseline is assessed qualitatively and quantitatively based on the number of tree and areas of woodland loss resulting from the delivery of the Scheme.

Manual for Roads and Bridges Volume 11, Section 2, Part 5 (August 2008)

3.3.1.2 Trees and woodlands within the United Kingdom are currently under threat from a range of different environmental factors including pests, diseases, the impacts of new development and the effects of climate change.

3.3.1.3 Given the likely long-term impacts associated with diseases such as Chalara dieback of ash (*Hymenoscyphus fraxineus*), and due to the number of ash trees within the Study Area, it would be reasonable to assume that this disease will have some detrimental impact on the future value of the baseline arboricultural resource. Whether this impact is significant will depend on a number of factors including the genetic resistance of the local ash trees to the disease and the ability of other tree species to self-seed or grow such that they replace any ash that die or become severely diseased.

3.3.1.4 In the short-term, resilience to threats associated with tree pests and diseases at a population level can be achieved through carefully planned mitigatory planting and tree or woodland management by ensuring that there is a diverse range of tree species present, and trees are adequately represented in all age groups from young to old and that those present are well suited to local environmental conditions.

3.3.1.5 Long-term resilience to climate change resulting from changes to future environmental conditions will also be achieved by sourcing of appropriate provenance and diversity of tree species for new planting proposals .

3.4 Significance criteria

3.4.1.1 The sensitivity of receptors identified in the Study Area have been assessed based on DMRB guidance (Volume 11, Section 2, Part 5)[14] and assigned as shown in **Table 3-1**. To align sensitivity of receptors as determined by DMRB with BS 5837 tree quality assessment a professional judgement was made.

Table 3-1 Environmental value[15]

Value (Sensitivity)	Typical Descriptors
Very High	Unlikely to apply to arboricultural receptors. Includes features of international value and importance.

[14] Highways Agency, Assessment and Management of Environmental Effects HA 205/08, Design Manual for Roads and Bridges Volume 11, Section 2, Part 5 (August 2008)

[15] Highways Agency, Assessment and Management of Environmental Effects HA 205/08, Design Manual for Roads and Bridges Volume 11, Section 2, Part 5 (August 2008)

Value (Sensitivity)	Typical Descriptors
High	▪ Trees, groups or woodlands which, because of their great age, size or habitat continuity are of exceptional value as arboricultural, landscape, conservation or cultural features (e.g. ancient or veteran trees and ancient woodland). ▪ As an irreplaceable habitat, ancient or veteran trees and ancient woodlands are of national importance.
Medium	▪ Trees, groups or woodlands of identifiable arboricultural, landscape or cultural value. ▪ Trees that are of particularly good examples of their species, especially if rare or unusual (e.g. notable specimens). ▪ Trees that are essential components of groups, or of formal or semi-formal arboricultural features. ▪ Trees, groups, or woodlands of particular visual importance as arboricultural or landscape features.
Low	▪ Trees that have the potential for high environmental value, but are downgraded because of impaired condition (e.g. the presence of significant though remediable defects including unsympathetic past management and storm damage) ▪ Trees lacking the special quality necessary to merit high environmental value designation ▪ Trees present in numbers, usually as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality ▪ Trees with material conservation or other cultural value.
Negligible	▪ Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories ▪ Trees present in groups or woodlands, but without this conferring on them significantly greater collective

Value (Sensitivity)	Typical Descriptors
	landscape value; or trees offering low or only temporary landscape benefits ▪ Trees with no material conservation or other cultural value ▪ Young trees with a stem diameter less than 150 mm.

3.4.1.2 The magnitude of impact will be assigned as described in **Table 3-2**.

Table 3-2 Magnitude of impact and typical descriptors[16]

Magnitude of Impact	Typical Arboricultural Descriptors
Major	Loss of ancient woodlands, ancient & veteran trees Major damage to many trees Loss of several trees (>15)
Moderate	Major damage to a number of trees Loss of a few trees (<10)
Minor	Major damage to a few trees Loss of 1 or 2 trees
Negligible	Minor damage to a few trees
No change	No impact

3.4.1.3 The significance of effect will be described as detailed in **Table 3-3**.

Table 3-3 Significance of effect[17]

Significance category	Typical descriptors
Very Large	Only adverse effects are normally assigned this level of significance. They represent key aspects in the decision-making process. The effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource

[16] Highways Agency, Assessment and Management of Environmental Effects HA 205/08, Design Manual for Roads and Bridges Volume 11, Section 2, Part 5 (August 2008)

[17] Highways Agency, Assessment and Management of Environmental Effects HA 205/08, Design Manual for Roads and Bridges Volume 11, Section 2, Part 5 (August 2008)

Significance category	Typical descriptors
	integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raise as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

3.4.1.4 The significance of effect will be determined by combining the magnitude of impact with the sensitivity of the receptor as presented in **Table 3-4**.

3.4.1.5 Where there is more than one significance of effects value for each Scheme option, a professional judgement will be made to select a single description. Overall significance of effect of moderate adverse or above has been determined as Significant. For slight significance of effect or below has been determined as Not Significant.

Table 3-4 Arriving at the significance of effect categories[18]

		Magnitude of impact (Degree of change)				
		No change	Negligible	Minor	Moderate	Major
Sensitivity	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

3.5 Assessment assumptions and limitations

3.5.1.1 The assumptions and limitations which apply to this assessment are outlined in **Table 3-5**. For each assumption or limitation an explanation of the possible effect of the assumption has been provided as well as a description of any corrective actions that have been taken to adjust for any limitations.

Table 3-5 Assessment assumptions and limitations for arboriculture

Assumption or Limitation	Result of Assumption or Limitation	Correction for Assumption or Limitation
Desk Study		
Possible data gaps in records held by Ancient Tree Inventory	Absence of records does not demonstrate the absence of ancient, veteran or notable trees, but may simply indicate a gap in recording coverage.	Lack of a full dataset may be material in the context of the comparative performance of the Scheme options.

[18] Highways Agency, Assessment and Management of Environmental Effects HA 205/08, Design Manual for Roads and Bridges Volume 11, Section 2, Part 5 (August 2008)

Assumption or Limitation	Result of Assumption or Limitation	Correction for Assumption or Limitation
		A precautionary basis had been adopted through the use of a combination of data sources, including third party data and the completion of field surveys where land access was available. Subject to land access approval, further survey work is likely to be required for PCF Stage 3 (Preliminary Design) to verify data collected as part of the desk study and to provide a comprehensive survey schedule.
Possible data gaps in records held on Natural England's ancient woodland inventory	Ancient woodlands smaller than 2 hectares (ha) are unlikely to appear on this inventory.	By using OS Master Map for other woodlands to assess impacts on overall woodland habitat loss, this deficiency has partially been addressed and should no longer be a major concern in the context of the comparative performance of the Scheme options. Subject to land access approval, further survey work is likely to be required for PCF Stage 3 (Preliminary Design) to survey smaller woodland sites for ancient and veteran trees.

Assumption or Limitation	Result of Assumption or Limitation	Correction for Assumption or Limitation
Survey data provided by third party organisations has not adequately covered all Scheme options	Mid Arun Valley Environmental Survey (MAVES) data concentrated around the central areas of the Scheme. MAVES have reported that areas located to the east of the River Arun were viewed at a distance from Public Rights of Way, using binoculars. Sussex Biodiversity Records Centre data covered a wide area, extending beyond the desk Study Area.	Third party data complements survey data to provide and fuller assessment for each Scheme option. To ensure consistency in survey methods, subject to land access approval, future survey work will be programmed at PCF Stage 3 (Preliminary Design) to verify third party data in accordance with BS 5837 methodology and update existing data collected as part of the desk study.
Field Survey		
BS 5837 Survey data has not adequately covered all Scheme options	Current baseline condition of ancient woodlands is unknown. Presence and value of individual trees in line with BS 5837 Categories remains unknown. Option 3V1, Option 4/5AV1, Option 4/5AV2, Option 5BV1 lack adequate survey data.	Lack of a full field survey dataset for Option 3V1, Option 4/5AV1, Option 4/5AV2 and Option 5BV1 may be of material consideration for medium and low value arboricultural receptors in the context of the comparative performance of the Scheme options. For high value arboricultural features, this has partly been corrected by using MAGIC Map for ancient woodlands and OS Master Map for other woodlands to assess impacts on

Assumption or Limitation	Result of Assumption or Limitation	Correction for Assumption or Limitation
		woodland habitat loss. Third party data has been used to complement BS 5837 survey data for assessing impacts on ancient and veteran trees, providing a fuller coverage of these Scheme options.
It was not possibly to safely access the entire Study Area due to land access restrictions	Arboricultural features within land where access was not possible have only been recorded where they could be viewed from a position of safety.	This has partly been corrected by using third party data to address gaps in information. Subject to land access approval, further survey work during PCF Stage 3 (Preliminary Design) will be required.
Reduced accuracy of tree locations in the absence of topographical plans	In the absence of a topographical plans, location of arboricultural receptors can only be considered accurate to approximately 5m. The tree locations provided should be considered approximate unless supported by a topographical plan at the time of site survey.	During PCF Stage 3 (Preliminary Design), further survey work will be required in conjunction with a topographical plan. The purpose will be to confirm location of arboricultural receptors and if possible, modifications to the design made to avoid impacts to these receptors as well as complete further detailed assessments.
Arboricultural survey data is typically valid for a period of two years.	Significant climate events (such as extreme weather conditions such as droughts, heatwaves, etc.) or changes	Subject to land access approval, future survey work will be programmed at PCF Stage 3 (Preliminary Design) to ensure

Assumption or Limitation	Result of Assumption or Limitation	Correction for Assumption or Limitation
	including alterations to the topography of the site may render survey data invalid within a shorter timescale.	survey data remains current.

3.5.1.2 For ancient woodlands, the Natural England Ancient Woodland Inventory data set was used. The resulting ancient woodland loss estimate is thus considered to provide a realistic estimate of the area of direct habitat loss which may be required to construct the Scheme. It is noted that this approach may underestimate indirect impacts (for example habitat fragmentation, increased windthrow risk), however, it provides a consistent basis for Scheme option differentiation.

4 Baseline Conditions

4.1.1.1 The baseline conditions described for arboriculture are derived from the following sources:

- Desk Study sources:
  - Woodland Trust Ancient Tree Inventory[19]
  - Mid Arun Valley Ecological Survey (MAVES)
  - Sussex Biodiversity Records Centre
  - Multi Agency Geographical Information for the Countryside[20] (MAGIC) maps
- Field Survey sources:
  - Walkover undertaken in October 2017 and March 2019.

4.1.1.2 Findings of the baseline resource has been collated and are included in **Appendix 1** of this report.

4.1.1.3 This section provides an overview of the baseline conditions for the Scheme, as shown in **Figure 1**.

4.1.1.4 **Table 4-1** summarises the baseline conditions for each Scheme option.

[19] Ancient Tree Inventory (2019) Tree Search. Available at: https://ati.woodlandtrust.org.uk/ (Accessed: 22 January 2019)

[20] Natural England (2019) Interactive mapping at your fingertips. Available at https://magic.defra.gov.uk (Accessed: 22 January 2019)

Table 4-1 Summary of baseline conditions by option for arboriculture

Key Environmental Value	Option 1V5	Option 1V9	Option 3V1	Option 4/5AV2	Option 4/5AV1	Option 5BV1
Individual Trees protected by a Tree Preservation Order	TPO trees located along western and central section of this Scheme option.	TPO trees located along western and central section of this Scheme option.	Not located on this Scheme option.	Not located on this Scheme option.	Cluster of TPO trees located towards the western end of the Scheme option.	Cluster of TPO trees located at western end of the option. TPO trees located towards the western end of this Scheme option, south of the footprint.
Tree groups or woodlands protected by a Tree Preservation Order	TPO woodlands located within ancient woodland towards western end of this Scheme option. Tree groups	TPO woodlands located within ancient woodland towards western end of this Scheme option. Tree groups	TPO woodlands located within ancient woodland at western end of this Scheme option.	TPO woodlands located within ancient woodland at western end of this Scheme option. Tree groups located at the western end of this	TPO woodlands located within other woodland at western end of this Scheme option. Tree groups located at the western end of this Scheme option	Not located on this Scheme option.

Key Environmental Value	Option 1V5	Option 1V9	Option 3V1	Option 4/5AV2	Option 4/5AV1	Option 5BV1
	located centrally within the vicinity of River Arun.	located centrally within the vicinity of River Arun.		Scheme option along Shellbridge Road.	along Shellbridge Road.	
Conservation Areas	Borders the northside of the Scheme option footprint centrally located.	Borders the northside of the Scheme option footprint centrally located.	Not located on this Scheme option.	Not located on this Scheme option.	Not located on this Scheme option.	Not located on this Scheme option.
All woodlands	Woodland areas located at the western end of the Scheme option.	Woodland areas located at the western end of the Scheme option.	Woodland areas located at the western end of the Scheme option.	Woodland areas located at western end and central sections of this Scheme option.	Located at western end and central section of this Scheme option.	Woodland areas located at the western end of the Scheme option.
Of which, Ancient Woodlands	Located at western end, of the Scheme option.	Located at western end, of the Scheme option.	Widely distributed along the western end, of the Scheme option.	Located at the western and central sections, of the Scheme option.	Located at the western and central sections, of the Scheme option.	Located close to western end, of the Scheme option.

Key Environmental Value	Option 1V5	Option 1V9	Option 3V1	Option 4/5AV2	Option 4/5AV1	Option 5BV1
Ancient and Veteran trees outside of woodlands	Distributed at the western end of the Scheme option.	Distributed at western end of Scheme option.	Not located on this Scheme option.	Distributed through the central and western section of this Scheme option.	Found in the central section of this Scheme option.	Found in the central section of this Scheme option.
BS 5837 Category A trees outside of woodlands	Widely distributed along the Scheme option.	Widely distributed along the Scheme option.	Available data shows that Category A trees are located within the western, central and eastern areas of this Scheme option.	Available data shows that Category A trees are located within western, west-central and eastern areas of this Scheme option.	Available data shows that Category A trees are located within western, west-central and eastern areas of this Scheme option.	Available data shows that Category A trees are located within west-central and eastern areas of this Scheme option.
BS 5837 Category B trees outside of woodlands	Widely distributed along the Scheme option.	Widely distributed along the Scheme option.	Available data shows that Category B trees are located within the western, central and eastern areas of this	Available data shows that Category B trees are located within western, west-central and eastern areas	Available data shows that Category B trees are located within western, west-central and eastern areas	Available data shows that Category B trees are located within west-central and eastern areas of this

Key Environmental Value	Option 1V5	Option 1V9	Option 3V1	Option 4/5AV2	Option 4/5AV1	Option 5BV1
			Scheme option.	of this Scheme option.	of this Scheme option.	Scheme option.
BS 5837 Category C trees outside of woodlands	Widely distributed along the Scheme option.	Widely distributed along the Scheme option.	Available data shows that Category C trees are located within the western, central and eastern areas of this Scheme option.	Available data shows that Category C trees are located within western, west-central and eastern areas of this Scheme option.	Available data shows that Category C trees are located within western, west-central and eastern areas of this Scheme option.	Available data shows that Category C trees are located within west-central and eastern areas of this Scheme option.
BS 5837 Category U trees outside of woodlands	Category U trees are located along the Scheme option.	Category U trees are located along the Scheme option.	Available data shows that Category U trees are located within the eastern areas of this Scheme option.	Available data shows that Category U trees are located within the eastern areas of this Scheme option.	Available data shows that Category U trees are located within the eastern areas of this Scheme option.	Available data shows that Category U trees are located within the eastern areas of this Scheme option.

4.2 Identified receptors

4.2.1.1 The receptors identified in the baseline within the Desk Study Area and Field Study Area are listed in **Table 4-2** with an assessment of their sensitivity. The sensitivity of receptors has been determined following the guidance outlined in **Table 3-1.**

4.2.1.2 For the purpose of a BS 5837 survey schedule, Category A arboricultural receptors include those of particular good examples of their species, especially if rare or unusual, (e.g. notable trees), or are a dominant or principal tree within an avenue. These receptors have limited potential for substitution. In line with Table 2.1 of DMRB Section 2, Part 5, these Category A arboricultural receptors have Medium sensitivity.

4.2.1.3 Category A trees also includes arboricultural receptors of significant conservation, historic or commemorative value such as ancient or veteran trees and ancient woodlands. However, as an irreplaceable habitat, these arboricultural receptors are of national importance. Therefore, according to Table 2.1 of DMRB Section 2, Part 5, irreplaceable habitats are of high importance and therefore have a DMRB sensitivity value rating of High.

4.2.1.4 Trees and woodlands subject to a TPO are those that have been deemed by a local planning authority as having beneficial interest of amenity in their area at time of confirmation. Therefore, TPO status may not reflect the quality of an arboricultural receptor. For this reason, arboricultural receptors subject to a TPO may have different category ratings as determined by a BS 5837 assessment.

Table 4-2 Sensitivity of identified receptors for arboriculture

Receptor	Sensitivity	BS 5837 Category
Ancient woodlands	High	A
Ancient and veteran trees	High	A
Notable trees	Medium	A
BS 5837 Category A trees	Medium	A
BS 5837 Category B trees	Low	B
BS 5837 Category C trees	Negligible	C
BS 5837 Category U trees	Negligible	U

5 Potential Impacts

5.1 Construction phase

5.1.1.1 The impacts considered during the construction phase are outlined in **Table 5-1**. No construction phase impacts have been scoped out of the assessment.

Table 5-1 Construction phase potential impacts for arboriculture

Potential Impact	Scoped Impact	Justification for Scoping Out
The fragmentation of ancient woodlands, an irreplaceable habitat	Scoped in.	Not applicable.
Impacts resulting from the permanent loss of significant areas or numbers of irreplaceable habitats (which includes ancient woodlands, ancient and veteran trees)	Scoped in.	Not applicable.
The removal of a significant number of arboricultural receptors of high, medium, low and negligible sensitivity (to include other woodlands and individual trees) to facilitate construction resulting in net loss of tree canopy cover	Scoped in	Not applicable .
Damage to soil, tree roots and canopies of retained trees resulting in the deterioration of their condition	Scoped in.	Not applicable.

5.2 Operational phase

5.2.1.1 Operational impacts will be assessed and mitigated where possible through detailed design of the selected route. It should be noted that operational effects are likely to remain similar to those at the time of construction. As such, any proposed mitigation is likely to require complex consideration within arboriculture, landscape and ecological experts working in partnership with highways engineers

5.2.1.2 The impacts to be considered during the operational phase as part of PCF Stage 3 (Preliminary Design) are outlined in **Table 5-2**. No operational phase impacts have been scoped out of the assessment.

Table 5-2 Operational phase potential impacts for arboriculture

Potential Impact	Scoped Impact	Justification for Scoping Out
Residual effects resulting from loss of large areas of ancient woodlands or fragmentation of these habitats	Scoped in	Not applicable
Overall net loss of tree canopy cover resulting from removal of arboricultural receptors	Scoped in	Not applicable
Increased exposure to windthrow	Scoped in	Not applicable
Damaged tree roots and canopies resulting from construction phase of retained trees leading to reduced value of arboricultural receptors	Scoped in	Not applicable
Likely long-term impacts associated with tree pest and diseases including Chalara dieback of ash (*Hymenoscyphus fraxineus*)	Scoped in	Not applicable
Climate change impacts resulting in changes to future local environmental conditions.	Scoped in	Not applicable
Regrowth of retained arboricultural features results in encroachment of tree roots and canopy across Highways England boundary	Scoped in	Not applicable

6 Design, Mitigation and Enhancement Measures

6.1 Design phase mitigation measures

6.1.1.1 For PCF Stage 2 (Option Selection), data available highlighted the location of high value arboriculture receptors such as ancient woodlands, and ancient and veteran trees. Adjustments to the design of Scheme options have been made to consider the location of these environmental constraints to reduce impacts as far as reasonably possible based on the review of third-party datasets and sites survey work carried out in 2017 and 2019.

6.2 Construction phase mitigation measures

6.2.1.1 Ancient woodlands and ancient or veteran trees are considered irreplaceable habitats that are important for their wildlife, soils, recreation, cultural value, history and contribution to the landscape. Once lost, it cannot be recreated. For this reason, it is not possible to mitigate for the loss of these habitats.

6.2.1.2 The conservation status of ancient woodland is dependent on the maintenance of its extent, species composition and the range of different woodland types it supports. Bisecting any woodland, particularly an ancient woodland, could result in significant loss of woodland cover. It may also negatively impact on the ecological value and natural heritage due to habitat fragmentation, and impact negatively on the natural plants and animals' ability to respond to the impacts of climate change.

6.2.1.3 The loss of these habitats cannot be fully compensated for. A compensation strategy can only partially compensate for loss or damage and should be appropriate to the location.

6.2.1.4 The National Policy Statement for National Networks (NPS NN) identifies ancient woodlands and ancient and veteran trees as potential constraints to development. It states that the loss of these trees should be justifiable by the national need for and benefits of the Proposed Scheme clearly outweigh the loss and provide the reasons for this. Failure to adequately justify the loss of ancient woodlands and ancient or veteran trees may be considered contrary to the NPS NN (Paragraph 5.32).

6.2.1.5 The NPPF takes this further, stating that development proposals that will result in the loss or deterioration of irreplaceable habitats "*should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists*" (Paragraph 175(c)).

6.2.1.6 The Forestry Commission and Natural England Standing Advice *"Ancient woodland, ancient trees and veteran trees: protecting them from developmen*t" recommends that a minimum 15 metres ecological buffer of semi-natural habitat should be left between any development and the edge of the ancient woodland. Non-provision of a 15 metre ecological buffer zone around an ancient woodland may be contrary to the Forestry Commission and Natural England Standing Advice. The buffer zone is important to provide some protection from deterioration of the woodland habitat. To reduce the impacts on environmental receptors located within the 15-metre buffer zone, localised amendments to the design of the Scheme may be appropriate along certain sections of the route. The purpose would be to reduce the working space required for construction where possible to improve the retention of these receptors. An ongoing programme of management will be required due to future regrowth of arboricultural receptors that are likely to result in encroachment of tree roots and canopy cover across the Highways England boundary.

6.2.1.7 Consideration should also be made for the viability of translocating ancient or veteran trees where they could be supported in a vertical position as standing deadwood, near other high value arboricultural receptors.

6.2.1.8 Natural England and the Forestry Commission's standing advice on ancient woodlands, and ancient and veteran trees provides guidance on the range of measures to be considered as part of a compensation package. These comprise:

- Restoring or managing other ancient woodland, including plantations on ancient woodland sites, and wood pasture
- The use of tree planting buffers to help enhance the resilience of neighbouring ancient woodlands
- Connecting woodland and ancient and veteran trees separated by development with the planting of trees, woodland and hedgerows
- Long-term management plans for new woodland and ancient woodland
- Identify and manage trees that could become ancient or veteran in the future
- Planting individual trees that could become veteran and ancient trees in future.

6.2.1.9 The Secretary of State may require conditions or obligations to secure adequate compensation measures and subsequent ecological monitoring to demonstrate the adverse impacts have been adequately considered and compensated for.

6.2.1.10 **Chapter 7** of this report highlights which of the above measures are appropriate for each of the proposed Scheme options. All proposed and new planting should be carefully planned to ensure successional planting and improve connectivity of habitats to maximise the benefits that would be achievable from each bespoke compensation package of measures.

6.2.1.11 BS 5837 Category A arboricultural receptors (a medium sensitivity receptor) include those with identifiable arboricultural features and specimens which are particularly good examples of their species, especially if rare or unusual (e.g. notable specimens) and other category A trees. Due to the long period of time taken for new trees to reach a point whereby they can provide the same size and age-related benefits as medium value arboricultural features, mitigation for the loss of any such specimens is unlikely to be achieved. However, new trees may compensate towards the loss of these features and, over the long-term, can offset some of the adverse impacts especially where they relate to visual amenity on a localised scale.

6.2.1.12 Although it is possible to mitigate for the loss of BS 5837 category B arboricultural receptors (low sensitivity receptors), it is not possible to secure trees of the same standard within one lifetime. There will be some short-term residual adverse effects associated with the loss of these arboricultural receptors. The introduction of new feature trees into the local area has the potential to mitigate this loss over the medium to long-term especially once they become established, start to mature and attain a reasonable size. Therefore, the loss of these receptors should be regarded as having sufficient value to be included in the scheme design and project specification.

6.2.1.13 Negligible sensitivity receptors (Category C and U arboricultural receptors) lack any special significance either arboriculturally, culturally or as prominent landscape features and a limited retention span of approximately 10 years or less. The loss of negligible sensitivity receptors should not be regarded as a planning constraint, due to mitigatory planting as part of a wider programme of replacement tree planting being adequately achievable within the lifetime of the scheme insofar as once established, new planting will have the capacity to effectively replace negligible value receptors which may be lost.

6.2.1.14 To mitigate for the net loss in overall tree canopy cover resulting from the loss of arboricultural receptors, a programme of replacement planting of trees, groups of trees and woodlands with a mixture of trees species and age classes in advance of proposed tree removal would be advisable.

6.2.1.15 The following additional designed in mitigation measures have been identified for the Scheme:

- Localised amendments designed in to maximise retention of arboricultural features and minimise damage to rooting areas of retained trees.
- The use of tree protection fencing where possible and appropriate construction exclusion zones to ensure protection of retained arboricultural features, including their stems, crowns, rooting areas and the soils with which they grow.
- Implement a programme of replacement tree and woodland planting in advance of proposed tree removal.

6.3 Operational phase design and mitigation measures

6.3.1.1 The following design elements and operational phase mitigation measures have been identified for the Scheme:

- Extending existing woodland boundaries through planting new trees, groups of trees or woodlands to maintain net tree canopy cover.
- Increase structural diversity of woodland areas at the local level to provide resilience against windthrow.
- Improve species and age diversity in new planting areas to build resilience to pests and diseases.
- Improve resilience to climate change through the sourcing of appropriate provenance and selection of tree species for new planting proposals which are more suited to current and future predicted environmental conditions.
- Long-term management plans to manage regrowth of retained arboricultural features results in encroachment of tree roots and canopy across Highways England boundary.

6.4 Opportunities for enhancement

6.4.1.1 Due to the loss of irreplaceable habitats such as ancient woodlands, ancient and veteran trees, opportunities for enhancement for arboricultural receptors will be challenging, and will be dependent on the range of measures to be used as part of the agreed compensation package.

6.4.1.2 For all other arboricultural receptors, the Scheme options provide opportunities for enhancement. Although they have not been included in the assessment of effects, the following opportunities for enhancement have been identified for the Scheme to be considered at PCF Stage 3 (Preliminary Design):

- Improve connectivity of tree and woodland habitats at the landscape scale.
- Management of existing trees and woodlands to improve and maintain their structural and physiological condition, particularly in locations important for amenity value.

7 Assessment of likely significant effects

7.1 Discussion

7.1.1.1 **Figure 3** shows the location of high value arboriculture receptors, to include ancient trees and woodlands, trees protected by a TPO, and the location of conservation areas.

7.1.1.2 A mixture of datasets has been used for this assessment. Where there are gaps in information, these are highlighted in **Table 3-5** and **Table 4-1**.

7.1.1.3 For the total woodland area, OS MasterMap data was used. This area includes ancient woodlands.

7.1.1.4 Fragmentation of woodland habitats leads to loss of habitats, and results in smaller woodland patches and increased spatial isolation. This in turn may lead to reduced woodland biodiversity and potentially reduces their long-term viability[21].

7.1.1.5 All but Option 5BV1 will result in the permanent loss of ancient woodland, a high sensitive arboricultural receptor. A suitable package of compensation measures to be considered for each Scheme option are detailed in **Sections 7.3** to **7.7** below.

7.1.1.6 All but Option 3V1 will result in the loss of ancient or veteran trees. Option 1V5 and Option 1V9 will result in the loss of two individual trees protected by a TPO. Option 1V9 and Option 4/5AV1 will result in the loss of a few trees located within a TPO group of trees, and Option 1V5, Option 1V9, Option 3V1, Option 4/5AV1 and Option 4/5AV2 will result in the partial loss of woodlands located within a TPO.

[21] Forestry Commission (2005) Information Note 73: Evaluating Biodiversity in fragmented landscapes. Available at: https://www.forestresearch.gov.uk/research/archive-evaluating-biodiversity-in-fragmented-landscapes-principles-2/ (Accessed 04 April 2019)

7.1.1.7 A TPO does not prevent the removal of these arboricultural receptors in order to implement development. It does however prevent their unauthorised removal and ensures that they can be fully considered when determining whether development is appropriate and acceptable. In the event that the partial loss of individual trees, tree groups or woodland within a TPO area is confirmed, a Development Consent Order has the ability to disapply permissions for works to these arboricultural receptors. However, where ancient woodlands or ancient and veteran trees fall within a TPO, planning requirements for irreplaceable habitats will apply. Trees located within a conservation area are not impacted.

7.1.1.8 The Scheme will result in the permanent loss of additional arboricultural receptors of medium, low and negligible sensitivity as outlined below and defined in **Table 4-2** above.

7.1.1.9 All Scheme options would result in overall net lost in tree canopy cover. To maintain overall net tree canopy cover, a programme of replacement planting will be required. Replacement planting for low and negligible sensitivity receptors will have the added benefit of improving overall quality of trees and therefore resilience to tree pests and diseases. To achieve this, a mixture of options is available including extending existing woodland boundaries through woodland creation, along with the planting of new trees and groups of trees.

7.1.1.10 All Scheme options will have trees or woodlands located within the 15-metre buffer of the Scheme option footprint. To minimise the risk of damage resulting from construction, appropriate tree protection fencing where possible and appropriate construction exclusion zones as outlined in Section 6.2 of BS5837 should be utilised to ensure protection of stems, crowns, rooting areas and soils of retained arboricultural receptors.

7.1.1.11 For a summary of the loss of arboricultural receptors for each Scheme option, see **Table 7-1** to **Table 7-3** below.

7.1.1.12 The likely significance of effect for of the operational phase of potential impact for all of the Scheme options is in relation to residual impacts from construction phase and ongoing routine maintenance as outlined in DMRB Volume 11, Section 2.

7.1.1.13 Significance of effects resulting from routine maintenance will be less than for the construction phase, and will be related to the impacts of arboricultural receptors on vision splay, sightlines at junctions etc. Likely significant effects are outlined in **Section 7.9.2** below.

Table 7-1 Calculations of tree and woodland removals within Scheme option footprint only

Option ID	Area	Area (ha) total woodland loss	Area (ha) ancient woodland loss	Ancient / veteran trees Loss	Category A trees Loss	Category B trees Loss	Category C trees Loss	Category U trees Loss	Total Trees
1V5	Option Only	4.98	1.95	2	23	19	26	0	70
1V9	Option Only	4.17	1.09	2	24	19	37	0	82
3V1	Option Only	12.16	9.20	0	7	4	10	0	21
4/5AV1	Option Only	1.91	0.40	1	2	4	4	0	11
4/5AV2*	Option Only	2.79	1.83	2	7	5	8	0	22
5BV1	Option Only	0.62	0.00	2	3	4	4	0	13
DMRB sensitivity		**-**	**High**	**High**	**Medium**	**Low**	**Negligible**	**Negligible**	**-**

Table 7-2 Calculations of tree and woodland at risk within 15 metre buffer area only.

Option_ID	Area	Area (ha) total woodland loss	Area (ha) ancient woodland loss	Ancient / veteran trees Loss	Category A trees Loss	Category B trees Loss	Category C trees Loss	Category U trees Loss	Total Trees
1V5	15m Buffer**	3.39	2.42	0	8	9	12	1	30
1V9	15m Buffer	3.26	2.32	0	8	10	8	1	27
3V1	15m Buffer	8.41	7.06	0	3	3	9	0	15
4/5AV1	15m Buffer	1.60	0.50	1	3	3	4	0	11
4/5AV2*	15m Buffer	2.54	1.51	5	4	6	6	0	21
5BV1	15m Buffer	0.87	0.00	2	1	2	5	0	10
DMRB sensitivity		-	High	High	Medium	Low	Negligible	Negligible	-

Table 7-3 Total calculations of all trees and woodlands impacted by Scheme options.

Option_ID	Area	Area (ha) total woodland loss	Area (ha) ancient woodland loss	Ancient / veteran trees Loss	Category A trees Loss	Category B trees Loss	Category C trees Loss	Category U trees Loss	Total Trees
1V5	Option + 15m Buffer	8.37	4.37	2	31	28	38	1	100
1V9	Option + 15m Buffer	7.44	3.41	2	32	29	45	1	109
3V1	Option + 15m Buffer	20.57	16.25	0	10	7	19	0	36
4/5AV1	Option + 15m Buffer	3.51	0.90	2	5	7	8	0	22
4/5AV2*	Option + 15m Buffer	5.33	3.34	7	11	11	14	0	43
5BV1	Option + 15m Buffer	1.49	0.00	4	4	6	9	0	23
DMRB sensitivity		**-**	**High**	**High**	**Medium**	**Low**	**Negligible**	**Negligible**	**-**

*** There is one veteran tree and one notable tree from 3rd party data which fall within the footprint of Option 4/5AV2**

**** This is the area of the 15 metres buffer only (the area between the outline of the footprint and the buffer)**

7.2 Future baseline/do minimum scenario

7.2.1.1 The future baseline or do minimum scenario is likely to be the same for all Scheme options.

7.2.1.2 Within the Study Area, the future baseline is expected to be significantly affected by ash dieback for the foreseeable future. Whilst the baseline arboricultural resource does offer a degree of diversity in terms of age and species this is somewhat limited in certain respects. Specifically, this includes a heavy reliance on oak and hazel in wooded areas and ash trees as a significant constituent within tree groups, and as a standalone individual specimen.

7.2.1.3 It is anticipated that Chalara dieback of ash will result in the loss of a number of ash trees from within the Study Area and this in turn will lead to a short to medium term reduction in the overall quality and value of the baseline arboricultural resource. However, in the absence of there being any other significant outbreaks of disease affecting other native tree species then this potentially adverse effect will most likely decline over the long-term as other trees increase in both numbers and size.

7.3 Option 1V5

7.3.1 Assessment of post-mitigation effects

7.3.1.1 As shown in **Table 7-4** and **Figure 2-1**, Option 1V5 is likely to result in the permanent removal 4.98ha of woodland, of which 1.95ha is ancient woodland (part of which falls within a woodland covered by a TPO), a high sensitivity arboricultural receptor. A further impact is the fragmentation of ancient woodland located to the east of the Arundel and District hospital site. At risk from impacts resulting in damage to root protection areas of arboricultural receptors located in the 15-metre buffer (as outlined for Field Study Area), is a further 3.39ha, of which 2.42ha is ancient woodland.

7.3.1.2 Due to the woodland area requiring removal, and the sensitivity status and fragmentation of the ancient woodland, in line with **Table 3-2**, the magnitude of impact has been assessed as major adverse. The resulting significance of effects has been assessed at very large adverse. This has been assessed as Significant due to the loss and fragmentation of ancient woodlands, an irreplaceable habitat.

7.3.1.3 To comply with existing Natural England and Forestry Commission advice, appropriate compensation measures to be considered for the loss of ancient woodland resulting from this Scheme option would include restoring or managing other ancient woodlands (including plantations on ancient woodland sites and wood pastures), the planting of tree buffers to help enhance the resilience of neighbouring ancient woodlands and identifying and protecting trees that could become ancient or veteran in the future. To reduce the impacts of fragmentation of woodland blocks, the implementation of a programme of new planting consisting of woodlands, tree groups and individual trees to extend existing woodland boundaries and improve habitat connectivity across the local landscape.

7.3.1.4 Option 1V5 would result in the permanent removal of two ancient or veteran trees, a high sensitivity arboricultural receptor. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverse, with significance of effect assessed as very large adverse. The loss of ancient and veteran trees has the potential to become key decision-making issue due to their status as an irreplaceable habitat. Therefore, this has been assessed as Significant.

7.3.1.5 Medium sensitivity arboricultural receptors includes BS 5837 Category A and notable trees. A total of 23 trees have been identified for removal, which includes two trees protected by a TPO. At risk within the 15-metre buffer is a further eight trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverse, with significance of effect assessed as large adverse.

7.3.1.6 Low sensitivity arboricultural receptors includes BS 5837 Category B. A total of 19 trees have been identified for removal. At risk is a further nine trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverse, with significance of effect assessed as moderate adverse.

7.3.1.7 The significance of effect for the loss of notable and Category A (medium sensitivity) and B (low sensitivity) arboricultural receptors results from the considerable number of individual trees marked for removal. The loss of these arboricultural receptors cannot be fully mitigated. Therefore, residual impacts will remain due to the time for replacement tree to grow within the lifetime of this Scheme.

7.3.1.8 Most of these trees are located alongside the existing route where they have visual amenity value at the local level. With the large to moderate adverse significant effect of the loss of these arboricultural receptors, location of replacement planting as part of an overall mitigation package will need careful consideration to provide a similar amenity value and canopy cover for this Option 1V5. For this reason, the effect for Category A (medium sensitivity) and B (low sensitivity) arboricultural receptors has been assessed as Significant.

7.3.1.9 Negligible sensitivity arboricultural receptors includes BS 5837 Category C and BS 5837 Category U. A total of 26 trees have been identified for removal. At risk within the 15-metre buffer is a further 13 trees. Magnitude of impact resulting in the removal of these arboricultural receptors has been assessed overall as major adverse, with significance of effect assessed as slight adverse. The magnitude of impact for the loss of Category C and U (negligible sensitivity) arboricultural receptors results from the number of individual trees marked for removal. The effects on these arboricultural receptors is therefore Not Significant.

7.3.1.10 The loss of negligible sensitivity arboricultural receptors should not be regarded as a planning constraint. Suitable mitigation measures would be to ensure no net loss in overall tree canopy cover for this Scheme option supported by a programme of replacement tree, groups of trees and woodlands with a mixture of trees species and age classes in advance of proposed tree removal would be advisable.

Table 7-4 Magnitude of impacts and significance of effects for Option 1V5

Receptor	Value (Sensitivity)	BS 5837 Category	Number / area removed (Option only)	Number / area at risk (+15 m buffer zone)	Construction Magnitude of Impact	Construction Significance of Effect	Significant/ Not Significant
Total woodland area	-	-	4.98 ha	3.39 ha	-	-	Significant
Of which Ancient Woodland	High	A	1.95 ha	2.42 ha	Major Adverse	Very Large Adverse	
Total number of individual trees	-	-	70	30	-	-	-
Ancient and Veteran trees outside a woodland	High	A	2	0	Major Adverse	Very Large Adverse	Significant
Notable and BS 5837 Category A trees	Medium	A	23	8	Major Adverse	Large Adverse	Significant
BS 5837 Category B trees	Low	B	19	9	Major Adverse	Moderate Adverse	Significant
BS 5837 Category C and U	Negligible	C and U	26	13	Major Adverse	Slight Adverse	Not Significant

7.4 Option 1V9

7.4.1 Assessment of post-mitigation effects

7.4.1.1 As shown in **Table 7-5** and **Figure 2-2**, Option 1V9 is likely to result in the permanent removal 4.17ha of woodland, of which 1.09ha is ancient woodland (part of which falls within a woodland covered by a TPO), a high sensitivity arboricultural receptors.

7.4.1.2 At risk from impacts resulting in damage to root protection areas of arboricultural receptors located in the 15-metre buffer (as outlined for Field Study Area), is a further 3.26ha, of which 2.32ha is ancient woodland.

7.4.1.3 Due to the woodland area requiring removal, and the sensitivity status of the ancient woodland, in line with **Table 3-2**, the magnitude of impact has been assessed as major adverse. The resulting significance of effects has been assessed at very large adverse. This has been assessed as Significant due to the loss of ancient woodland, an irreplaceable habitat.

7.4.1.4 To comply with Natural England and Forestry Commission standing advice, appropriate compensation measures to be considered for the loss of ancient woodland resulting from this Scheme option would include restoring or managing other ancient woodlands, including plantations on ancient woodland sites and wood pastures, the planting of tree buffers to help enhance the resilience of neighbouring ancient woodlands and identifying and protecting trees that could become ancient or veteran in the future.

7.4.1.5 Two tree groups protected by a TPO will also be impacted. For one tree group, partial loss will occur at the end where the group meets Ford Road. For the second tree group, located along the River Arun, partial loss will occur at the northern end of the group.

7.4.1.6 Option 1V9 would result in the permanent removal of two ancient or veteran trees, a high sensitivity arboricultural receptor. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverse, with significance of effect assessed as very large adverse. The loss of ancient and veteran trees has the potential to become key decision-making issue due to their status as an irreplaceable habitat. Therefore, this has been assessed as Significant.

7.4.1.7 Medium sensitivity arboricultural receptors includes BS 5837 Category A and notable trees. A total of 24 trees have been identified for removal, which includes two trees protected by a TPO. At risk within the 15-metre buffer is a further eight trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverse, with significance of effect assessed as large adverse.

7.4.1.8 Low sensitivity arboricultural receptors includes BS 5837 Category B. A total of 19 trees have been identified for removal. At risk is a further 10 trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverese, with significance of effect assessed as moderate adverse.

7.4.1.9 The significance of effect for the loss of notable and Category A (medium sensitivity) and B (low sensitivity) arboricultural receptors results from the considerable number of individual trees marked for removal. The loss of these arboricultural receptors cannot be fully mitigated. Therefore, residual impacts will remain due to the time for replacement tree to grow within the lifetime of this Scheme.

7.4.1.10 Most of these trees are located alongside the existing route where they have visual amenity value at the local level. With the large to moderate adverse significant effect of the loss of these arboricultural receptors, location of replacement planting as part of an overall mitigation package will need careful consideration to provide a similar amenity value and canopy cover for this Option 1V9. For this reason, the effect for Category A (medium sensitivity) and B (low sensitivity) arboricultural receptors has been assessed as Significant.

7.4.1.11 Negligible sensitivity arboricultural receptors includes BS 5837 Category C and BS 5837 Category U. A total of 37 trees have been identified for removal. At risk within the 15-metre buffer is a further nine trees. Magnitude of impact resulting in the removal of these arboricultural receptors has been assessed overall as major adverse, with significance of effect assessed as slight adverse. The magnitude of impact for the loss of Category C and U (negligible sensitivity) arboricultural receptors results from the number of individual trees marked for removal. The effects on these arboricultural receptors is therefore Not Significant.

7.4.1.12 The loss of negligible sensitivity arboricultural receptors should not be regarded as a planning constraint. Suitable mitigation measures would be to ensure no net loss in overall tree canopy cover for this Scheme option supported by a programme of replacement tree, groups of trees and woodlands with a mixture of trees species and age classes in advance of proposed tree removal would be advisable.

Table 7-5 Magnitude of impacts and significance of effects for Option 1V9

Receptor	Value (Sensitivity)	BS 5837 Category	Number / area removed (Option only)	Number / area at risk (+15 m buffer zone)	Construction Magnitude of Impact	Construction Significance of Effect	Significant/ Not Significant
Total woodland area	-		4.17 ha	3.26 ha	-	-	Significant
Of which Ancient Woodland	High	A	1.09 ha	2.32 ha	Major Adverse	Very Large Adverse	
Total number of individual trees	-	-	82	27	-	-	-
Ancient and Veteran trees outside a woodland	High	A	2	0	Major Adverse	Very Large Adverse	Significant
Notable and BS 5837 Category A	Medium	A	24	8	Major Adverse	Large Adverse	Significant
BS 5837 Category B	Low	B	19	10	Major Adverse	Moderate Adverse	Significant
BS 5837 Category C and U	Negligible	C and U	37	9	Major Adverse	Slight Adverse	Not Significant

7.5 Option 3V1

7.5.1 Assessment of post-mitigation effects

7.5.1.1 As shown in **Table 7-6** and **Figure 2-3**, Option 3V1 is likely to result in the permanent removal 12.16ha of woodland (part of which falls within a TPO), of which 9.20ha is ancient woodland (again, part of which falls within a woodland covered by a TPO), a high sensitivity arboricultural receptors. A further impact is the fragmentation of a significant block of ancient woodland known as Binsted Wood.

7.5.1.2 At risk from impacts resulting in damage to root protection areas of arboricultural receptors located in the 15-metre buffer (as outlined for Field Study Area), is a further 8.41ha, of which 7.06ha is ancient woodland.

7.5.1.3 Due to the significant area of woodland requiring removal, and the sensitivity status of the ancient woodland, in line with **Table 3-2**, the magnitude of impact has been assessed as major adverse. The resulting significance of effects has been assessed at very large adverse. This has been assessed as Significant due to the loss of ancient woodlands, an irreplaceable habitat.

7.5.1.4 This Scheme option will result in the fragmentation of a substantial block of ancient woodland. This will not only result in significant loss of woodland cover, it will also negatively impact on the ecological value and natural heritage due to habitat fragmentation, and impact negatively on the natural plants and animals' ability to respond to the impacts of climate change. To minimise the further loss of high value environmental receptors careful consideration will be required to ensure stability of trees to reduce the risk of windthrow along the new woodland edge resulting from bisecting the woodland.

7.5.1.5 To adequately compensate for the loss of ancient woodland will be challenging. To be compliant with Natural England and Forestry Commission standing advice, appropriate compensation measures to be considered for this Scheme option will include long term management of remaining woodlands to enhance the quality of surrounding ancient woodland blocks. Other options would include restoring or managing other ancient woodlands, including plantations on ancient woodland sites and wood pastures, the planting of tree buffers to help enhance the resilience of surrounding ancient woodlands and identifying and protecting trees that could become ancient or veteran in the future. To reduce the impacts of fragmentation of woodland blocks, the implementation of a programme of new planting consisting of woodlands, tree groups and individual trees to extend existing woodland boundaries and improve habitat connectivity across the local landscape

7.5.1.6 Implementing measures to avoid overall net loss in tree canopy cover resulting from this Scheme option may go some way towards contributing to a suitable compensation package. However, the area of woodland creation required to adequately compensate for the loss of ancient woodland may need to be located away from the Scheme beside existing ancient woodland sites and other ancient or veteran trees.

7.5.1.7 Medium sensitivity arboricultural receptors includes BS 5837 Category A and notable trees. A total of seven trees have been identified for removal. At risk within the 15-metre buffer is a further three trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as moderate adverse, with significance of effect assessed as moderate adverse.

7.5.1.8 Low sensitivity arboricultural receptors includes BS 5837 Category B. A total of four trees have been identified for removal. At risk is a further three trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as moderate adverse, with significance of effect assessed as slight adverse.

7.5.1.9 Negligible sensitivity arboricultural receptors includes BS 5837 Category C and BS 5837 Category U. A total of 10 trees have been identified for removal. At risk within the 15-metre buffer is a further nine trees. Magnitude of impact resulting in the removal of these arboricultural receptors has been assessed overall as moderate adverse, with significance of effect assessed as slight adverse.

7.5.1.10 To mitigate for the moderate significance of effects resulting from the loss of medium sensitivity arboricultural receptors is achievable in the long-term through the planting of individual trees that could become veteran and ancient trees in the future. Due to the time required to fully mitigate for the loss of these arboricultural receptors, the effects will have local significance. Therefore, this has been assessed as Significant.

7.5.1.11 In addition, the implementation of a programme of replacement tree planting with a mixture of trees species and age classes in advance of the proposed tree removals would contribute to the proposed mitigation package. This approach will also contribute to mitigation for slight significance of effect resulting from the loss of low and negligible value arboricultural receptors. The ability for these effects to be absorbed within the Scheme design is achievable. For this reason, this effect has been assessed as Not Significant.

Table 7-6 Magnitude of impacts and significance of effects for Option 3V1

Receptor	Value (Sensitivity)	BS 5837 Category	Number / area removed (Option only)	Number / area at risk (+15 m buffer zone)	Construction Magnitude of Impact	Construction Significance of Effect	Significant/ Not Significant
Total woodland area	-	-	12.16 ha	8.41 ha	-	-	Significant
Of which Ancient Woodland	High	A	9.20 ha	7.06 ha	Major Adverse	Very Large Adverse	
Total number of individual trees	-	-	21	15	-	-	-
Ancient and Veteran trees outside a woodland	High	A	0	0	No Change	Neutral	Not Significant
Notable and BS 5837 Category A	Medium	A	7	3	Moderate Adverse	Moderate Adverse	Significant
BS 5837 Category B	Low	B	4	3	Moderate Adverse	Slight Adverse	Not Significant
BS 5837 Category C and U	Negligible	C and U	10	9	Moderate Adverse	Slight Adverse	Not Significant

7.6 Option 4/5AV1

7.6.1 Assessment of post-mitigation effects

7.6.1.1 As shown in **Table 7-7** and **Figure 2-4**, Option 4/5AV1 is likely to result in the permanent removal 1.91ha of woodland, of which 0.40ha is ancient woodland, a high sensitivity arboricultural receptors. A further impact is the partial loss of a woodland that falls within a TPO area and the fragmentation of woodland located at the western end of the Scheme.

7.6.1.2 At risk from impacts resulting in damage to root protection areas of arboricultural receptors located in the 15-metre buffer (as outlined for Field Study Area), is a further 1.60ha, of which 0.50ha is ancient woodland.

7.6.1.3 Due to the woodland area requiring removal, and the sensitivity status of the ancient woodland, in line with **Table 3-2**, the magnitude of impact has been assessed as major adverse. The resulting significance of effects has been assessed at very large adverse. This has been assessed as Significant due to the loss of ancient woodlands, an irreplaceable habitat.

7.6.1.4 To comply with Natural England and Forestry Commission standing advice, appropriate compensation to be considered for the loss of ancient woodland resulting from this Scheme option would include restoring or managing other ancient woodlands, including plantations on ancient woodland sites and wood pastures and the implementation of a programme of new planting consisting of woodlands, tree groups and individual trees to extend existing woodland boundaries and improve habitat connectivity across the local landscape.

7.6.1.5 Tree groups protected by a TPO will also be impacted. These are located at the southern end of Shellbridge Road.

7.6.1.6 Option 4/5AV1 would result in the permanent removal of one ancient or veteran tree, a high sensitivity arboricultural receptor. At risk within the 15-metre buffer is a second ancient or veteran tree. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverse, with significance of effect assessed as very large adverse. The loss of ancient and veteran trees has the potential to become key decision-making issue due to their status as an irreplaceable habitat. Therefore, this has been assessed as Significant.

7.6.1.7 Medium sensitivity arboricultural receptors includes BS 5837 Category A and notable trees. A total of two trees have been identified for removal. At risk within the 15-metre buffer is a further three trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as minor adverse, with significance of effect assessed as slight adverse.

7.6.1.8 Low sensitivity arboricultural receptors includes BS 5837 Category B. A total of four trees have been identified for removal. At risk is a further three trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as moderate adverse, with significance of effect assessed as slight adverse.

7.6.1.9 Negligible sensitivity arboricultural receptors includes BS 5837 Category C and BS 5837 Category U. A total of four trees have been identified for removal. At risk within the 15-metre buffer is a further four trees. Magnitude of impact resulting in the removal of these arboricultural receptors has been assessed overall as moderate adverse, with significance of effect assessed as slight adverse.

7.6.1.10 To mitigate for the slight significance of effects resulting from the loss of medium, low and negligible sensitivity arboricultural receptors is achievable in the long-term through the planting of individual trees that could become veteran and ancient trees in the future. In addition, the implementation of a programme of replacement tree planting with a mixture of trees species and age classes in advance of the proposed tree removals would contribute to the proposed mitigation package. The ability for these effects to be absorbed within the Scheme design is achievable. For this reason, this has been addressed a Not Significant.

Table 7-7 Magnitude of impacts and significance of effects for Option 4/5AV1

Receptor	Value (Sensitivity)	BS 5837 Category	Number / area removed (Option only)	Number / area at risk (+15 m buffer zone)	Construction Magnitude of Impact	Construction Significance of Effect	Significant / Not Significant
Total woodland area	-		1.91 ha	1.60 ha	-	-	Significant
Of which Ancient Woodland	High	A	0.40 ha	0.50 ha	Major Adverse	Very Large Adverse	
Total number of trees	-		11	11	-	-	-
Ancient and Veteran trees outside a woodland	High	A	1	1	Major Adverse	Very Large Adverse	Significant
Notable and BS 5837 Category A	Medium	A	2	3	Minor Adverse	Slight Adverse	Not Significant
BS 5837 Category B	Low	B	4	3	Moderate Adverse	Slight Adverse	Not Significant
BS 5837 Category C and U	Negligible	C and U	4	4	Moderate Adverse	Slight Adverse	Not Significant

7.7 Option 4/5AV2

7.7.1 Assessment of post-mitigation effects

7.7.1.1 As shown in **Table 7-8** and **Figure 2-5**, Option 4/5AV2 is likely to result in the permanent removal 2.79ha of woodland, of which 1.83ha is ancient woodland (part of which falls within a woodland covered by a TPO), a high sensitivity arboricultural receptors. A further impact is the fragmentation of ancient woodland located at the western end of the Scheme.

7.7.1.2 At risk from impacts resulting in damage to root protection areas of arboricultural receptors located in the 15-metre buffer (as outlined for Field Study Area), is a further 2.54ha, of which 1.51ha is ancient woodland.

7.7.1.3 Due to the significant area of woodland requiring removal, and the sensitivity status of the ancient woodland, in line with **Table 3-2**, the magnitude of impact has been assessed as major adverse. The resulting significance of effects has been assessed at very large adverse. This has been assessed as Significant due to the loss of ancient woodlands, an irreplaceable habitat.

7.7.1.4 Bisecting any woodland, particularly an ancient woodland, will not only result in significant loss of woodland cover, but will also negatively impact on the ecological value and natural heritage due to habitat fragmentation, and impact negatively on the natural plants and animals' ability to respond to the impacts of climate change.

7.7.1.5 To comply with Natural England and Forestry Commission standing advice, appropriate compensation measures to be considered for the loss of ancient woodland resulting from this Scheme option would include restoring or managing other ancient woodlands, including plantations on ancient woodland sites and wood pastures, the planting of tree buffers to help enhance the resilience of neighbouring ancient woodlands and identifying and protecting trees that could become ancient or veteran in the future. To reduce the impacts of fragmentation of woodland blocks, the implementation of a programme of new planting consisting of woodlands, tree groups and individual trees to extend existing woodland boundaries and improve habitat connectivity across the local landscape.

7.7.1.6 Option 4/5AV2 would result in the permanent removal of two ancient or veteran trees, a high sensitivity arboricultural receptor. At risk within the 15-metre buffer is a further five trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverse, with significance of effect assessed as very large adverse. The loss of ancient and veteran trees has the potential to become key decision-making issue. Therefore, this has been assessed as Significant.

7.7.1.7 Medium sensitivity arboricultural receptors includes BS 5837 Category A and notable trees. A total of seven trees have been identified for removal. At risk within the 15-metre buffer is a further four trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as moderate adverse, with significance of effect assessed as moderate adverse.

7.7.1.8 Low sensitivity arboricultural receptors includes BS 5837 Category B. A total of five trees have been identified for removal. At risk is a further six trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as moderate adverse, with significance of effect assessed as slight adverse.

7.7.1.9 Negligible sensitivity arboricultural receptors includes BS 5837 Category C and BS 5837 Category U. A total of eight trees have been identified for removal. At risk within the 15-metre buffer is a further six trees. Magnitude of impact resulting in the removal of these arboricultural receptors has been assessed overall as moderate adverse, with significance of effect assessed as slight adverse.

7.7.1.10 To mitigate for the moderate significance of effects resulting from the loss of medium value arboricultural receptors is achievable in the long-term through the planting of individual trees that could become veteran and ancient trees in the future. Due to the time required to fully mitigate for the loss of these arboricultural receptors, the effects will have local significance. Therefore, this has been assessed as Significant.

7.7.1.11 In addition, the implementation of a programme of replacement tree planting with a mixture of trees species and age classes in advance of the proposed tree removals would contribute to the proposed mitigation package. This approach will also contribute to mitigation for slight significance of effect resulting from the loss of low and negligible value arboricultural receptors. The ability for these effects to be absorbed within the scheme design is achievable. For this reason, this has been assessed as Not Significant.

Table 7-8 Magnitude of impacts and significance of effects for Option 4/5AV2

Receptor	Value (Sensitivity)	BS 5837 Category	Number / area removed (Option only)	Number / area at risk (+15 m buffer zone)	Construction Magnitude of Impact	Construction Significance of Effect	Significant/ Not Significant
Total woodland area	-		2.79 ha	2.54 ha	-	-	Significant
Of which Ancient Woodland	High	A	1.83 ha	1.51 ha	Major Adverse	Very Large Adverse	
Total number of trees	-		22	21	-	-	-
Ancient and Veteran trees outside a woodland	High	A	2	5	Major Adverse	Very Large Adverse	Significant
Notable and BS 5837 Category A	Medium	A	7	4	Moderate Adverse	Moderate Adverse	Significant
BS 5837 Category B	Low	B	5	6	Moderate Adverse	Slight Adverse	Not Significant
BS 5837 Category C and U	Negligible	C and U	8	6	Moderate Adverse	Slight Adverse	Not Significant

7.8 Option 5BV1

7.8.1 Assessment of post-mitigation effects

7.8.1.1 As shown in **Table 7-9** and **Figure 2-6**, Option 5BV1 is likely to result in the permanent removal 0.62ha of woodland, of which none is ancient woodland. At risk from impacts resulting in damage to root protection areas of arboricultural receptors located in the 15-metre buffer (as outlined for Field Study Area), is a further 0.87ha, of which none is ancient woodland.

7.8.1.2 The area of woodland identified for removal has been determined through the GIS shapefile. The condition of this woodland has been assessed purely based on a desk study and resources available online, including MAGIC Map and has not been subject to a BS 5837 survey. MAGIC Map has identified impacted woodlands as Priority Habitat Inventory – Lowland Deciduous Broadleaved Woodland which implies this is a well-established mature woodland. Purely based on resources available online, along with the landscape and amenity value this woodland is likely to have due to the location, a BS 5837 Category B is assumed. This will need to be confirmed through a site visit as part of PCF Stage 3 (Preliminary Design) assessment.

7.8.1.3 Due to the likely number of trees located within this area of woodland requiring removal, in line with **Table 3-2**, the magnitude of impact has been assessed as major adverse. The resulting significance of effects has been assessed at moderate adverse. Therefore, this effect has been assessed as Significant.

7.8.1.4 Option 5BV1 would result in the permanent removal of two ancient or veteran trees, a high sensitivity arboricultural receptor. At risk within the 15-metre buffer is a further two trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as major adverse, with significance of effect assessed as very large adverse. The loss of ancient and veteran trees has the potential to become key decision-making issue due to their status as an irreplaceable habitat. Therefore, this has been assessed as Significant.

7.8.1.5 Medium sensitivity arboricultural receptors includes BS 5837 Category A and notable trees. A total of three trees have been identified for removal. At risk within the 15-metre buffer is a single tree. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as minor adverse, with significance of effect assessed as slight adverse.

7.8.1.6 Low sensitivity arboricultural receptors includes BS 5837 Category B. A total of four trees have been identified for removal. At risk is a further two trees. Magnitude of impact resulting in the removal of these value receptors has been assessed overall as moderate adverse, with significance of effect assessed as slight adverse.

7.8.1.7 Negligible sensitivity arboricultural receptors includes BS 5837 Category C and BS 5837 Category U. A total of four trees have been identified for removal. At risk within the 15-metre buffer is a further five trees. Magnitude of impact resulting in the removal of these arboricultural receptors has been assessed overall as moderate adverse, with significance of effect assessed as slight adverse.

7.8.1.8 To mitigate for the slight significance of effects resulting from the loss of medium, low and negligible sensitivity arboricultural receptors is achievable in the long-term through the planting of individual trees that could become veteran and ancient trees in the future. In addition, the implementation of a programme of replacement tree planting with a mixture of trees species and age classes in advance of the proposed tree removals would contribute to the proposed mitigation package. The ability for these effects to be absorbed within the Scheme design is achievable. For this reason, this has been assessed as Not Significant.

Table 7-9 Magnitude of impacts and significance of effects for Option 5BV1

Receptor	Value (Sensitivity)	BS 5837 Category	Number / area removed (Option only)	Number / area at risk (+15 m buffer zone)	Construction Magnitude of Impact	Construction Significance of Effect	Significant/ Not Significant
Total woodland area	Low	B	0.62 ha	0.87 ha	Major Adverse	Moderate Adverse-	Significant
Of which Ancient Woodland	High	A	0.00 ha	0.00 ha			
Total number of trees	-		13	10	-	-	-
Ancient and Veteran trees outside a woodland	High	A	2	2	Major Adverse	Very Large Adverse	Significant
Notable and BS 5837 Category A	Medium	A	3	1	Minor Adverse	Slight Adverse	Not Significant
BS 5837 Category B	Low	B	4	2	Moderate Adverse	Slight Adverse	Not Significant
BS 5837 Category C and U	Negligible	C and U	4	5	Moderate Adverse	Slight Adverse	Not Significant

7.9 Summary

7.9.1 Construction phase

7.9.1.1 The likely Construction Phase significance of effect on arboricultural receptors for each of the Scheme options is outlined in **Table 7-10**.

7.9.2 Operation phase

7.9.2.1 The likely significance of effect of Operational Phase potential impact for all of the Scheme options is in relation to routine maintenance as outlined in DMRB Volume 11, Section 2.

7.9.2.2 A full assessment of significant effects cannot be assessed until PCF Stage 3 (Preliminary Design) and PCF Stage 5 (Construction Preparation), when the tree planting compensation and mitigation proposals have been finalised. The assessment of likely significant effects of the Operational Phase will be dependent on the long-term measures agreed to compensate for the very large adverse significant effects resulting from loss of ancient woodland and moderate adverse significance effects resulting from the loss of ancient and veteran trees.

7.9.2.3 As an irreplaceable habitat, Scheme options that result in the loss of ancient woodlands and ancient or veteran trees are considered important for their wildlife, soils, recreation, cultural value, history and contribution to the landscape. Once an irreplaceable habitat is lost, it cannot be recreated. To adequately compensate for the loss of these high sensitivity receptors will be challenging, particular for Scheme options impacting on large areas of ancient woodlands or result in fragmentation of these habitats. This will result in a residual significance of effects during operational phase

7.9.2.4 In addition, in instances where the significance of effects notable and Category A (medium sensitivity) and B (low sensitivity) has been identified as moderate adverse to large adverse will also be dependent on the measures agreed to mitigate for the loss of these arboricultural receptors. Residual impacts will remain due to the time for replacement tree to grow within the lifetime of this Scheme. The loss of these arboricultural receptors are a material consideration within the decision-making process due to the significant number of individual trees marked for removal.

Significance of effects will be less than for the construction phase. Additional significant effects to be considered will be related to the impacts of arboricultural receptors on vision splay, sightlines at junctions etc.

Table 7-10 Arboriculture construction phase likely significant effects

Impact	Option 1V5	Option 1V9	Option 3V1	Option 4/5AV1	Option 4/5AV2	Option 5BV1
Permanent removal of woodland, including ancient woodland	Very Large Adverse Significant	Very Large Adverse Significant	Very Large Adverse Significant	Very Large Adverse Significant	Very Large Adverse Significant	Moderate Adverse Significant
Permanent removal of ancient and veteran trees	Very Large Adverse Significant	Very Large Adverse Significant	Neutral Not Significant	Very Large Adverse Significant	Very Large Adverse Significant	Very Large Adverse Significant
Permanent removal of notable and Category A trees	Large Adverse Significant	Large Adverse Significant	Moderate Adverse Significant	Slight Adverse Not Significant	Moderate Adverse Significant	Slight Adverse Not Significant
Permanent removal of Category B trees	Moderate Adverse Significant	Moderate Adverse Significant	Slight Adverse Not Significant	Slight Adverse Not Significant	Slight Adverse Not Significant	Slight Adverse Not Significant
Permanent removal of Category C and U trees	Slight Adverse Not Significant	Slight Adverse Not Significant	Slight Adverse Not Significant	Slight Adverse Not Significant	Slight Adverse Not Significant	Slight Adverse Not Significant

8 Acronyms

Table 8-1 Acronyms

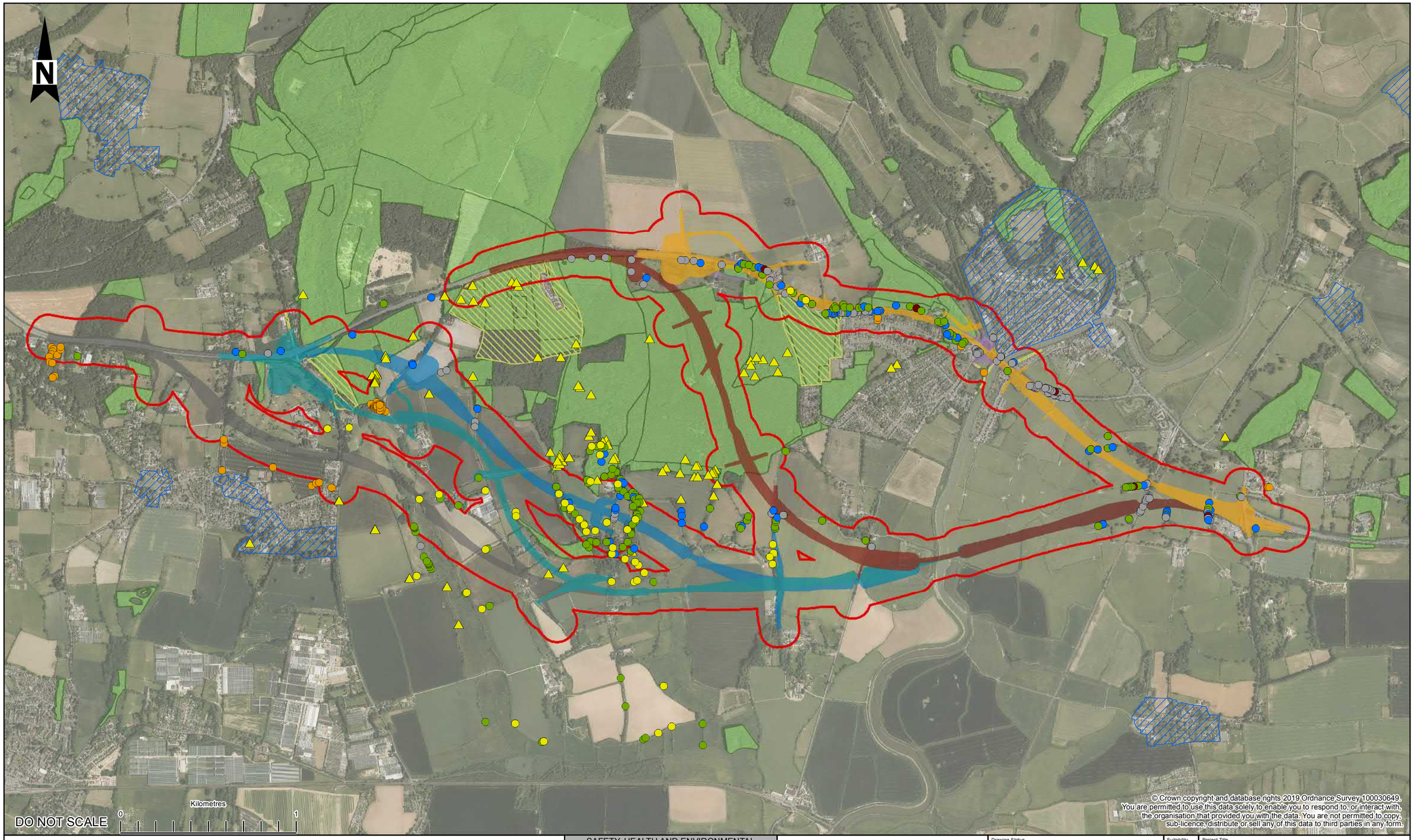
Acronym	Explanation
MAGIC	Multi Agency Geographical Information for the Countryside
MAVES	Mid Arun Valley Ecological Survey
NPPF	National Planning Policy Framework
NPS NN	National Policy Statement National Networks
TPO	Tree Preservation Order

9 Glossary

Table 9-1 Glossary

Term	Definition
Ancient Tree	A tree that has passed beyond maturity and is old, or aged, in comparison with trees of the same species. Characterised by biological, cultural or aesthetic features of interest.
Ancient Woodland	Any wooded area that has been continuously wooded since 1600 AD
Arboriculturist	A person who has, through relevant education, training or experience, gained expertise in the field of trees in relation to construction.
Construction Exclusion Zone	An area within which all site clearance and construction activities, access and storage of materials are prohibited.
Crown	The upper part of a tree, measured from the lowest branch, including all branches and foliage.
Notable Tree	A tree that is very large but might not qualify as ancient or veteran.
Root Protection Area	Layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's vitality.
Veteran Tree	A tree that has the biological or aesthetic characteristics of an ancient tree but is not ancient in years compared with others of the same species.
Woodland fragmentation	The bisecting of a woodland block into two or more patches unconnected by natural vegetation.

Figures



KEY:

- OPTION 1V5
- OPTION 1V9
- OPTION 3V1
- OPTION 4/5AV1
- OPTION 4/5AV2
- OPTION 5BV1
- ALL OPTIONS 100M BUFFER

SURVEY DATA 2017 & 2019 COMBINED

- A
- B
- C
- U
- ANCIENT / VETERAN

THIRD PARTY TREE SURVEY

- ANCIENT / VETERAN / NOTABLE

STATUTORY & NON STATUTORY

- TPO TREES
- TPO TREE GROUPS / WOODLANDS
- CONSERVATION AREAS
- ANCIENT WOODLAND

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 1
BASELINE ARB DATASETS

Scale	Drawn	Checked	Approved	Authorised
1:20,000	AS	ND	MD	PA

Original Size	Date	Date	Date	Date
A3	26/06/19	26/06/19	26/06/19	26/06/19

Drawing Number: HE551523-WSP-GEN-SWI-GI-DR-0163
Project | Originator | Volume | Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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N

DO NOT SCALE

0 Kilometres 1

KEY:

OPTION 1V5

SURVEY DATA 2017 & 2019 COMBINED

- A
- B
- C
- U
- ANCIENT / VETERAN
- TREE CATEGORIES REMOVED

THIRD PARTY TREE SURVEY

- ANCIENT / VETERAN / NOTABLE

STATUTORY & NON STATUTORY

- TPO TREES
- TPO TREE GROUPS / WOODLANDS
- CONSERVATION
- ANCIENT WOODLAND
- OTHER WOODLAND
- OTHER WOODLAND TO BE REMOVED
- ANCIENT WOODLAND REMOVED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
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Drawing Title: FIGURE 2-1:
TREE REMOVAL
O1V5

Scale	Drawn	Checked	Approved	Authorised
1:11,000	AS	ND	MD	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	26/06/19	26/06/19	26/06/19	26/06/19

Drawing Number: Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0279
Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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Kilometres

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1

DO NOT SCALE

KEY:

OPTION 1V9

SURVEY DATA 2017 & 2019 COMBINED

- A
- B
- C
- U
- ANCIENT / VETERAN
- TREE CATEGORIES REMOVED

THIRD PARTY TREE SURVEY

- ANCIENT / VETERAN / NOTABLE

STATUTORY & NON STATUTORY

- TPO TREES
- TPO TREE GROUPS / WOODLANDS
- CONSERVATION AREAS
- ANCIENT WOODLAND
- OTHER WOODLAND
- OTHER WOODLAND TO BE REMOVED
- ANCIENT WOODLAND REMOVED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 2-2:
TREE REMOVAL
O1V9

Scale	Drawn	Checked	Aproved	Authorised
1:11,000	AS	ND	MD	PA
Original Size: A3	Date: 26/06/19	Date: 26/06/19	Date: 26/06/19	Date: 26/06/19

Drawing Number: Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0280
Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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N

Kilometres

0 1

DO NOT SCALE

KEY:

OPTION 3V1

SURVEY DATA 2017 & 2019 COMBINED

- A
- B
- C
- U
- ANCIENT / VETERAN
- TREE CATEGORIES REMOVED

THIRD PARTY TREE SURVEY

- ANCIENT / VETERAN / NOTABLE

STATUTORY & NON STATUTORY

- TPO TREES
- TPO TREE GROUPS / WOODLANDS
- CONSERVATION AREAS
- ANCIENT WOODLAND
- OTHER WOODLAND
- OTHER WOODLAND TO BE REMOVED
- ANCIENT WOODLAND REMOVED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: WORK IN PROGRESS

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 2-3:
TREE REMOVAL
O3V1

Scale	Drawn	Checked	Approved	Authorised
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Original Size	**Date**	**Date**	**Date**	**Date**
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Drawing Number
Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0281
Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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KEY:

OPTION 4/5AV1

SURVEY DATA 2017 & 2019 COMBINED

- A
- B
- C
- U
- ANCIENT / VETERAN
- TREE CATEGORIES REMOVED

THIRD PARTY TREE SURVEY

- ANCIENT / VETERAN / NOTABLE

STATUTORY & NON STATUTORY

- TPO TREES
- TPO TREE GROUPS / WOODLANDS
- CONSERVATION AREAS
- ANCIENT WOODLAND
- OTHER WOODLAND
- OTHER WOODLAND TO BE REMOVED
- ANCIENT WOODLAND REMOVED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Client: Working on behalf of highways england

Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 2-4:
TREE REMOVAL
O4/5AV1

Scale	Drawn	Checked	Approved	Authorised
1:18,000	AS	ND	MD	PA

Original Size	Date	Date	Date	Date
A3	26/06/19	26/06/19	26/06/19	26/06/19

Drawing Number
Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0281
Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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N

DO NOT SCALE

Kilometres 0 1

KEY:

OPTION 4/5AV2

SURVEY DATA 2017 & 2019 COMBINED

- A
- B
- C
- U
- ANCIENT / VETERAN
- TREE CATEGORIES REMOVED

THIRD PARTY TREE SURVEY

- ANCIENT / VETERAN / NOTABLE
- ANCIENT / VETERAN REMOVED

STATUTORY & NON STATUTORY

- TPO TREES
- TPO TREE GROUPS / WOODLANDS
- CONSERVATION
- ANCIENT WOODLAND
- OTHER WOODLAND
- OTHER WOODLAND TO BE REMOVED
- ANCIENT WOODLAND REMOVED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 2-5:
TREE REMOVAL
O4/5AV2

Scale	Drawn	Checked	Approved	Authorised
1:18,000	AS	ND	MD	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	26/06/19	26/06/19	26/06/19	26/06/19

Drawing Number: Project | Originator | Volume | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0282

Location

Project Ref. No.: 70052558

Revision: P01

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N

Kilometres

DO NOT SCALE 0 1

KEY:

OPTION 5BV1

SURVEY DATA 2017 & 2019 COMBINED

- A
- B
- C
- U
- ANCIENT / VETERAN
- TREE CATEGORIES REMOVED

THIRD PARTY TREE SURVEY

- ANCIENT / VETERAN / NOTABLE

STATUTORY & NON STATUTORY

- TPO TREES
- TPO TREE GROUPS / WOODLANDS
- CONSERVATION AREAS
- ANCIENT WOODLAND
- OTHER WOODLAND
- OTHER WOODLAND TO BE REMOVED
- ANCIENT WOODLAND REMOVED

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decommissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL BYPASS

Drawing Title: FIGURE 2-6: TREE REMOVAL O5BV1

Scale	Drawn	Checked	Approved	Authorised
1:20,000	AS	ND	MD	PA
Original Size: A3	Date: 26/06/19	Date: 26/06/19	Date: 26/06/19	Date: 26/06/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
HE551523-WSP-GEN-SWI-GI-DR-0282

Project Ref. No.: 70052558

Revision: P01

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N

Kilometres

0 1

DO NOT SCALE

KEY:

- OPTION 1V5
- OPTION 1V9
- OPTION 3V1
- OPTION 4/5AV1
- OPTION 4/5AV2
- OPTION 5BV1
- ALL OPTIONS 100M BUFFER

SURVEY DATA 2017 & 2019 COMBINED

- ANCIENT / VETERAN

THIRD PARTY TREE SURVEY

- ANCIENT / VETERAN / NOTABLE

STATUTORY & NON STATUTORY

- TPO TREES
- TPO TREE GROUPS / WOODLANDS
- CONSERVATION
- ANCIENT WOODLAND
- OTHER WOODLAND

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATON

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

Maintenance / Cleaning

Use

Decomissioning / Demolition

Rev.	Date	Description	By	Chk'd	App'd
P01.1	---	First Issue	---	---	---

Drawing Status: FINAL

Suitability: S0

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Project Title: REGIONAL INVESTMENT PROGRAMME
A27 ARUNDEL BYPASS

Drawing Title: FIGURE 3:
ARBORICULTURE
CONSTRAINTS MAP

Scale	Drawn	Checked	Aproved	Authorised
1:20,000	AS	ND	MD	PA
Original Size	**Date**	**Date**	**Date**	**Date**
A3	26/06/19	26/06/19	26/06/19	26/06/19

Drawing Number
Project | Originator | Volume
HE551523-WSP-GEN-SWI-GI-DR-0286
Location | Type | Role | Number

Project Ref. No.: 70052558

Revision: P01

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Appendix 1 of Appendix 7-3: Findings of the collated online Arboricultural resource

Option_ID	Area	Area (ha) total woodland loss	Area (ha) ancient woodland loss	Ancient / veteran trees Loss	Category A trees Loss	Category B trees Loss	Category C trees Loss	Category U trees Loss	Total Trees	Within the footprint
1V5	Option Only	4.98	1.95	2	23	19	26	0	70	
1V9	Option Only	4.17	1.09	2	24	19	37	0	82	
3V1	Option Only	12.16	9.20	0	7	4	10	0	21	
4/5AV1	Option Only	1.91	0.40	1	2	4	4	0	11	
4/5AV2*	Option Only	2.79	1.83	**2**	**7**	5	8	0	22	
5BV1	Option Only	0.62	0.00	2	3	4	4	0	13	
DMRB sensitivity		**-**	**High**	**High**	**Medium**	**Low (or Lower)**	**Negligible**	**Negligible**	**-**	

Option_ID	Area	Area (ha) total woodland loss	Area (ha) ancient woodland loss	Ancient / veteran trees Loss	Category A trees Loss	Category B trees Loss	Category C trees Loss	Category U trees Loss	Total Trees	Between footprint and 15m buffer
1V5	15m Buffer**	3.39	2.42	0	8	9	12	1	30	
1V9	15m Buffer	3.26	2.32	0	8	10	8	1	27	
3V1	15m Buffer	8.41	7.06	0	3	3	9	0	15	
4/5AV1	15m Buffer	1.60	0.50	1	3	3	4	0	11	
4/5AV2*	15m Buffer	2.54	1.51	**5**	**4**	6	6	0	21	
5BV1	15m Buffer	0.87	0.00	2	1	2	5	0	10	
DMRB sensitivity		**-**	**High**	**High**	**Medium**	**Low (or Lower)**	**Negligible**	**Negligible**	**-**	

Option_ID	Area	Area (ha) total woodland loss	Area (ha) ancient woodland loss	Ancient / veteran trees Loss	Category A trees Loss	Category B trees Loss	Category C trees Loss	Category U trees Loss	Total Trees	Within the 15m buffer
1V5	Option + 15m Buffer	8.37	4.37	2	31	28	38	1	100	
1V9	Option + 15m Buffer	7.44	3.41	2	32	29	45	1	109	
3V1	Option + 15m Buffer	20.57	16.25	0	10	7	19	0	36	
4/5AV1	Option + 15m Buffer	3.51	0.90	2	5	7	8	0	22	
4/5AV2*	Option + 15m Buffer	5.33	3.34	**7**	**11**	11	14	0	43	
5BV1	Option + 15m Buffer	1.49	0.00	4	4	6	9	0	23	
DMRB sensitivity		**-**	**High**	**High**	**Medium**	**Low (or Lower)**	**Negligible**	**Negligible**	-	

*** There is one veteran tree and one notable tree from 3rd party data which fall within the footprint of Option 4/5AV2**

**** This is the area of the 15 metres buffer only (the area between the outline of the footprint and the buffer)**