REPORT N^{O} HE551511-WSP-EGN-M3J9PCF1-RP-EN-ESR01

M3 JUNCTION 9 IMPROVEMENT SCHEME

PCF STAGE 1: ENVIRONMENTAL STUDY REPORT

SEPTEMBER 2016

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1 INTRODUCTION AND OVERVIEW

1.1 THE SCHEME AND STAGE OF THE SCHEME

1.1.1 The scheme is titled the 'M3 Junction 9 Improvement' scheme and is a junction improvement scheme. One of the principal aims of the project is to develop a comprehensive package of improvements, including the introduction of free-flow movements between the M3 and A34 at Junction 9.

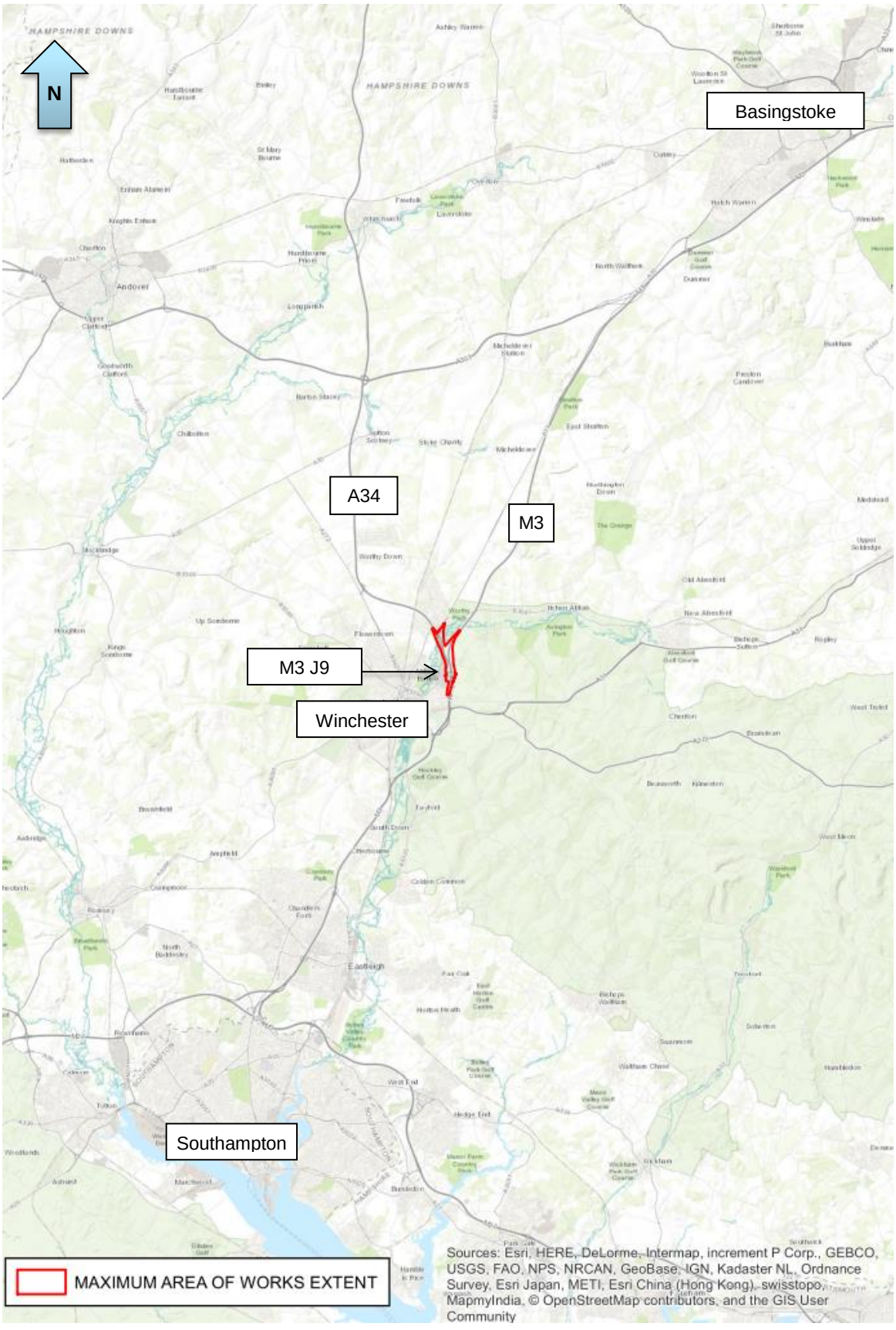
1.1.2 This Project Control Framework (PCF) Stage 1 Environmental Study Report (ESR) for the M3 Junction 9 (M3 J9) improvement, will inform the option identification for the proposed improvements of the M3 J9. The preferred option will be selected during PCF Stage 2, and if the selected option requires a Statutory EIA, it will be prepared during PCF Stage 3.

1.1.3 A Scoping Report was prepared in June 2016 (HE551511-WSP|PB-EGE-M3J9-RE-EN-001) and set out the scope of work required to prepare this PCF Stage 1 ESR.

1.2 LOCATION OF SCHEME

1.2.1 The strategic road network around Winchester forms a key gateway between South Hampshire and the East (via the M3), the Midlands and the North (via the A34) and the West (via the A303). M3 Junction 9 is a key transport interchange which connects South Hampshire (and the wider sub-region, with London and the Midlands/North of England. Figure 1.1 illustrates the scheme at the regional scale. The red line boundary marked in Figure 1.1 illustrates the anticipated maximum extent of the area of works required (the 'scheme area'), which covers all options under consideration at PCF Stage 1 and is hereafter referred to as 'the scheme'.

Figure 1-1: Scheme location at the regional scale



1.3 PURPOSE OF THE REPORT (INCLUDING REPORTING OF THE DETERMINATION PROCESS)

The Stage 1 ESR has been prepared to inform the selection and development of scheme options for the M3 Junction 9 Improvement, It provides an overview of the environmental constraints in the scheme area, and the potential environmental benefits associated with the scheme options. The report has identified further assessment(s) required if potentially severe environmental constraints are associated with any of the scheme options set out in Table 3-2.

1.4 SCOPE AND CONTENT

1.4.1 The ESR considers the five options shortlisted for consideration thorugh the Stage 1 PCF process. These are shown in the design drawings and are described in Section 3.2 of the ESR (refer Figures 3.1 to 3.5, Appendix A).

1.5 STRUCTURE OF THE REPORT

1.5.1 The report is structured as follows:

- Chapters 1-3 provide the background to the scheme, including a description of the alternative options, Scheme objectives, policy and land use setting and land-take
- Chapter 4 describes the methodology used for the assessments
- Chapters 5-13 present the findings of the high level environmental assessment, and provide a comparison of each of the options:

  5. Air Quality

  6. Cultural Heritage

  7. Landscape (and Arboriculture)

  8. Nature Conservation

  9. Geology and Soils

  10. Materials

  11. Noise and Vibration

  12. People and Communities

  13. Road Drainage and the Water Environment

- Chapters 14-16 present the cumulative effects assessment; the outline Environmental Management Plan; and a summary of the likelihood of significant effects

1.5.2 Each technical chapter is structured as follows:

- Introduction
- Assessment Methodology
- Baseline Conditions
- Regulatory and Policy Framework

- Design, mitigation and enhancement measures, including monitoring requirements
- Overall Assessment
- Indication of any difficulties encountered; and
- Summary

2 THE SCHEME

2.1 BACKGROUND TO THE SCHEME

2.1.1 In March 2015, the Department for Transport (DfT) published the Road Investment Strategy (RIS) which sets out a list of improvement schemes that will be developed by Highways England over the period 2015-2020.

2.1.2 The RIS outlines a long-term investment programme for the strategic road network, with a package of committed funding available to provide:

- A long-term vision for the strategic road network, outlining how Highways England will create smooth, smart and sustainable roads
- A multi-year investment plan that will be used to improve the network and create better roads for users
- High-level objectives for the first roads period 2015 to 2020

2.1.3 Junction 9 of the M3 is a key transport interchange on the strategic road network which connects South Hampshire and the wider sub-region, with London via the M3 and the Midlands via the A34 (which also links to the principal east-west A303 corridor). A large volume of traffic currently uses the interchange (approximately 6,000 vehicles per hour during the peak periods), which acts as a bottleneck on the local and strategic highway network, causing significant delays.

2.1.4 The main objective of the scheme is to introduce free-flow movement between the M3 and A34 at Junction 9. By providing an unconstrained link, vehicles will not be required to manoeuvre through a priority or signal controlled junction. This will reduce congestion and improve journey time reliability on the M3, A34 and local road network.

2.2 REGULATORY FRAMEWORK AND SCHEME OBJECTIVES

NATIONAL POLICY

2.2.1 The Government's National Networks National Policy Statement (NN NPS) (December 2014) sets out the need for, and Government's policies to deliver, Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. The Secretary of State is required to use the NN NPS as the primary basis for making decisions on development consent applications for national networks NSIPs in England.

2.2.2 In setting out Government's posiition, the NN NPS indicates that improvements are vital to alleviate congestion on the highways network. Paragraph 2.17 states that:

"It is estimated that around 16% of all travel time in 2010 was spent delayed in traffic, and that congestion has significant economic costs: in 2010 the direct costs of congestion on the Strategic Road Network in England were estimated at £1.9 billion per annum."

2.2.3 Further detail on the regulatory and policy framework is provided in Appendix 2.1.

SCHEME OBJECTIVES

2.2.4 The RIS aims to provide schemes that meet the five objectives set out in Table 2-1. The scheme's alignment with the strategic aims of the RIS are also demonstrated in Table 2-1.

Table 2-1: Highways England objectives and how the scheme aligns with the strategic aims

OBJECTIVE	HOW THE SCHEME ALIGNS WITH THE RIS STRATEGIC AIMS	MEASURE FOR SUCCESS OF OBJECTIVE
Objective 1: Supporting economic growth.	Unlocked development capacity for job, business and housing creation	→ Local employment rates → Consultation with Local Enterprise Partnership → Improved journey-time
Objective 2: A safe and serviceable network	The improvements to the M3 Junction 9 would improve safety as a result of reduced delays, queue lengths	→ Comparison of accident data
Objective 3: A more free flowing network	The improvements to the M3 Junction 9 aim to reduce the amount of congestion and increase journey-time reliability.	→ Improved journey-time → Reduced queue lengths
Objective 4: An improved environment	Reduce the number of people adversely effected by noise; Improve the air quality at sensitive receptors; No net loss in biodiversity by 2020	→ Air quality surveys /monitoring → Noise surveys/ monitoring → Biodiversity survey
Objective 5: A more accessible and integrated network	The improvements to the M3 Junction 9 would also include improvements for non-motorised users including cyclists and equestrians. There is currently a break in National Cycle Network Route 23, where it crosses M3 Junction 9. The scheme would include improved provisions for cyclists, to enable route 23 to continue across the junction.	→ Consultation with stakeholders and the local community → Non-Motorised User surveys

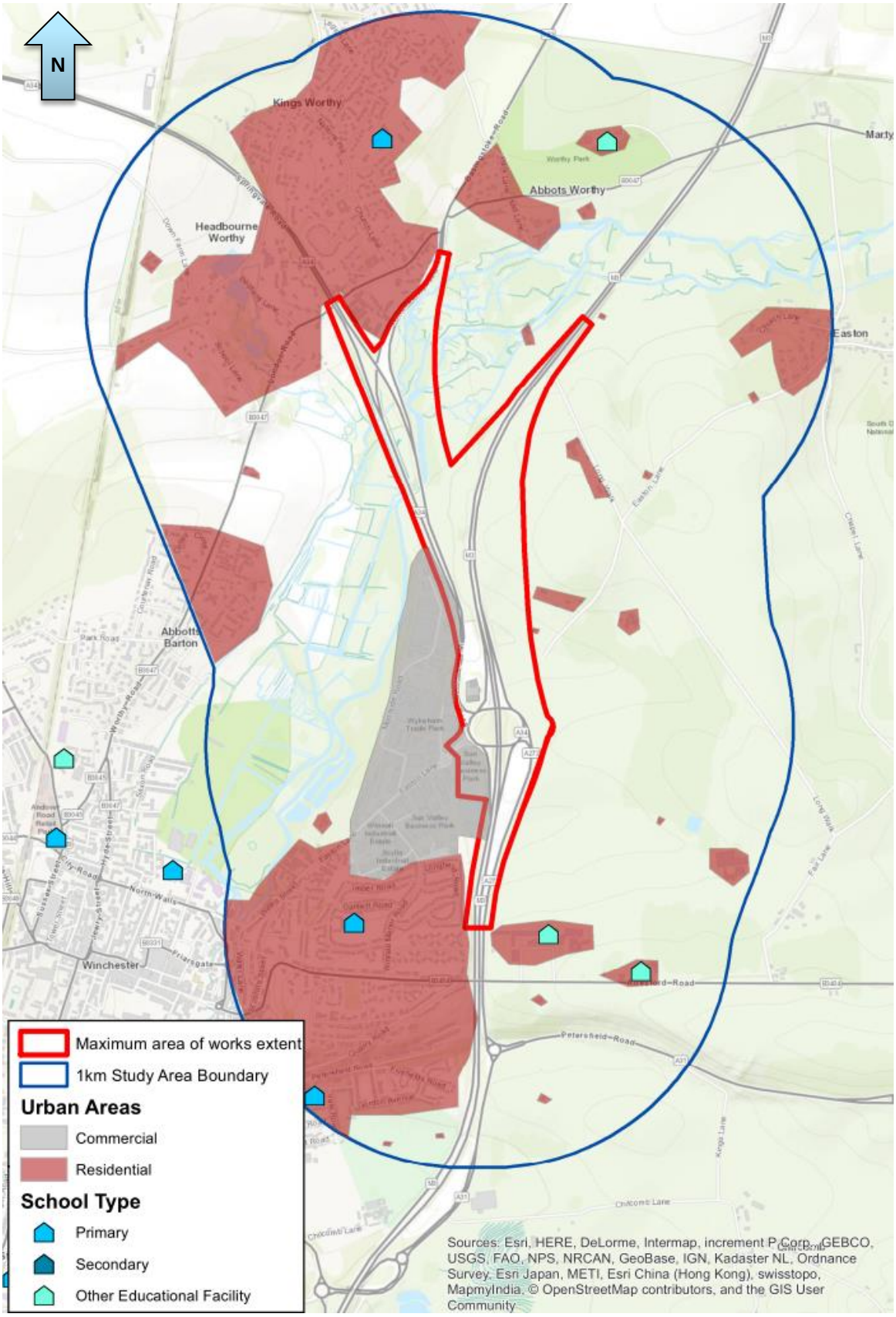
2.3 LAND USE, SETTING AND LAND TAKE

2.3.1 Junction 9 of the M3 is located within the county of Hampshire. The surrounding area is primarily urban to the west of the M3 and primarily rural to the east. There are large concentrations of residential receptors close to the A34 in the north of the study area (in Headbourne Worthy, Kings Worthy and Abbots Worthy) and close to the M3 to the south of the study area (on the eastern fringe of Winchester). A small number of isolated farm holdings or rural dwellings lie to the east of the scheme. There are six schools (including St Swithun's School north of the B3404 and east of the M3) within the study area.

2.3.2 Immediately west of the scheme there is a commercial zone. This includes include Sun Valley Business Park, Tesco, Winnall Industrial Estate and Scylla Industrial Estate. Wykeham Trade Park and Highways England's maintenance depot are located to the northwest of the junction.

2.3.3 Residential and commercial areas and schools are shown in Figure 2.1

Figure 2-1: Residential/commercial areas and schools



2.3.4 Approximately half of the scheme area is located within the South Downs National Park (SDNP). The SDNP also extends outside of the scheme area to the north, east, south and some areas to the west. The land to the east is generally green field. The River Itchen and associated floodplain are present within the north part of the study area. The scheme lies along the River Itchen valley with the base of the valley to the west of the junction. The River Itchen Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI) also extend to the north-east and south-west. Figure 2.2, Appendix A, shows the environmental constraints associated with the scheme.

2.3.5 Land take will be required for all of the scheme options with the amount of land required varying between each option.

2.4 CONSTRUCTION, OPERATION AND LONG TERM MANAGEMENT

2.4.1 Construction, operational and long term management arrangements are not known at this stage. Any assumptions made within this ESR on the impacts of construction, operation and management are based on prior experience with similar schemes.

3 ALTERNATIVES UNDER CONSIDERATION

3.1 PREVIOUS STUDIES INTO OPTIONS

3.1.1 A Preliminary Environmental Risk Assessment was conducted at PCF Stage 0 which included a high level consideration of environmental constraints in relation to the scheme and an initial environmental risk assessment of the scheme.

3.1.2 Numerous options were considered in the PCF Stage 1 ESR Scoping Report. However, several of these scheme options were rejected in the early stages of PCF Stage 1 for the reasons outlined in Table 3-1.

3.1.3 Several scheme options were considered prior to the PCF process and these had a variety of naming conventions. This PCF Stage 1 ESR has considered 5 options and uses the numbering and naming convention set out in Table 3-2 to avoid confusion with the pre-PCF process options. For clarity, there were not options 1-10 in entirety prior to the PCF process. All options considered during the PCF process are described in either Table 3-1 or Table 3-2.

Table 3-1: Rejected options (March, 2016)

PCF STAGE 1 OPTION	NAME	DESCRIPTION	CURRENT STATUS
12	120kph Two Step Relaxation Under M3	Development of WSP PCF Stage 0 Option 4 / Atkins Package 3. Free flow links between M3 and A34. A34 southbound link passing under M3 design to 120kph with two step relaxation on horizontal geometry. Modified from Atkins/Enterprise Mouchel work to include south facing J9 slip roads; and retain maintenance depot. Traffic modelling to inform decision if existing J9 roundabout and bridges are retained or are replaced with dumbbell arrangement.	Rejected on buildability grounds
13	120kph Tow Step Relaxation over M3	Development of WSP PCF Stage 0 Option 4 / Atkins Package 3. Free flow links between M3 and A34. A34 southbound link passing over M3 design to 120kph with two step relaxation on horizontal geometry. Modified from Atkins/Enterprise Mouchel work to include south facing J9 slip roads; and retain maintenance depot. Traffic modelling to inform decision if existing J9 roundabout and bridges retained or replaced with dumbbell arrangement.	Rejected on buildability grounds and visual impact
15	85kph Two Step Relaxation Over M3	Development of WSP PCF Stage 0 Option 4 / Atkins Package 3. Free flow links between M3 and A34. A34 southbound link passing over M3 design to 85kph with two step relaxation on horizontal geometry. Modified from Atkins /Enterprise Mouchel work to include south facing J9 slip roads; and retain maintenance depot. Traffic modelling to inform decision if existing J9 roundabout and bridges retained or replaced with dumbbell arrangement.	Rejected on buildability grounds and visual impact
17	Loop Junction Design	A revisit of Atkins Package 1 to review against transport modelling, environmental constraints and impact of earthworks profile on SDNP.	Rejected due to impact on SDNP

3.2 OPTIONS ASSESSED WITHIN THIS ESR

3.2.1 Five options have been assessed within this ESR, namely:

- Option 11: 120kph Free Flow Design
- Option 14: 85kph Two Step Relaxation Under M3 Free Flow Design
- Option 16A: Incremental Delivery – Southbound A34 Free Flow Link
- Option 16B: Incremental Delivery – Northbound A34 Free Flow Link
- Option 18: J9 Throughabout

3.2.2 The five options are visually presented in Figures 3.1 to 3.5 within Appendix A. Table 3-2, and described in detail in Table 3-2.

Table 3-2: Options for assessment (March, 2016)

PCF STAGE 1 OPTION	NAME	DESCRIPTION	FIGURE NUMBER (APPENDIX A)
11	Compliant Free Flow Design	Option 11 will provide free-flowing links between the A34 and the M3 in the north and southbound direction; this option has a design speed of 120kph. The existing northbound on-slip and southbound off-slip will be removed and replaced with new slip-roads. The current two bridge roundabouts at M3 junction 9, will be replaced with a new single bridge dumbbell layout. The new layout will be built off-line within the existing circulatory carriageway. The existing link roads to the roundabout will be realigned to the new dumbbell layout. The northbound M3 carriageway will be widened from two to four lanes prior to Junction 9. South of Junction 9, the two nearside lanes will be signed and line marked, for the A34 with access to Junction 9 provided via the existing northbound off slip, which will be narrowed to two lanes on the approach to the new roundabout arrangement. The two A34 lanes will pass under Junction 9 after which they will diverge from the M3 to form the new M3 northbound to A34 link with the remaining two offside lanes continuing north as the M3. The new M3 northbound to A34 link will utilise the existing A34 southbound River Itchen crossing and then tie in with the existing two lane A34 alignment after passing over the A33. The A34 southbound to M3 link will be realigned prior to the existing southbound River Itchen Bridge and will require a new bridge over the River Itchen and the realignment of the A33/A34 merge. The A34 will pass under the M3 in order to reduce the visual impact on the SDNP. The A34 link to M3 then splits in two with two lanes continuing under Junction 9 and merging with the M3 south of the existing on-slip merge and two lanes linking the A34 with Junction 9. The existing M3 northbound on-slip is to be removed to accommodate the new free-flowing A34 northbound link. The existing northbound A34 carriageway will be reused as a link from the Junction 9 roundabout to the A34 northbound and the A33 northbound, with a new northbound on-slip to the M3 diverging from this link, 400m north of Junction 9. The M3 northbound on-slip will pass under the new M3 northbound to A34 link and over the new A34 southbound to M3 Link before merging with the M3 approximately 500m downstream of the	Figure 3.1

PCF STAGE 1 OPTION	NAME	DESCRIPTION	FIGURE NUMBER (APPENDIX A)
		existing northbound merge. Access to the Highways England depot will be provided by a dedicated link from the proposed Junction 9 roundabout. The existing M3 southbound off-slip diverge will be removed and replaced with a new off-slip, with the diverge located approximately 1km north of the current diverge. The new southbound off-slip will then merge with the new A34 to roundabout link to maintain its access to Junction 9. **Note:** This option is being developed as a baseline for comparison of other options, and to identify cost savings from any future departures from standard,	
14	85kph Two Step Relaxation Under M3	Option 14 has been developed to reduce the land take and visual impact upon the SDNP, when compared to Option 11. Option 14 provides a free-flowing link between the A34 and the M3 with a design speed of 85kph. As with Option 11, the Junction 9 circulatory roundabout will be replaced with an offline dumbbell roundabout; all link roads that access the roundabout will require realignment to this new layout. The northbound M3 carriageway will be widened from two to four lanes prior to Junction 9. South of Junction 9, the two nearside lanes will be signed and line marked for the A34 with access to Junction 9 provided via the existing northbound off slip which will be narrowed to two lanes on the approach to the new roundabout arrangement. The two A34 lanes will pass under Junction 9 after which they diverge from the M3 to form the new M3 northbound to A34 link with the remaining two offside lanes continuing north as the M3. The M3 northbound to A34 link will cross over the new M3 northbound on-slip and tie in with the existing A34 alignment before the existing River Itchen Bridge. The A34 southbound to M3 link will diverge from the existing A34 alignment after the existing River Itchen Bridge. The A34 will then pass under the M3 in order to reduce visual impact on the SDNP. The A34 link to M3 then splits in two with two lanes continuing under Junction 9 and merging with the M3 south of the existing on-slip merge and two lanes linking the A34 with Junction 9. The existing M3 northbound on-slip is to be removed to accommodate the new free-flowing A34 northbound link. The existing northbound A34 carriageway will be reused as a link from the Junction 9 roundabout to the M3 northbound to A34 link with a merge prior to the River Itchen Bridge. There will also be a new northbound on-slip to the M3 diverging from this link, 400m north of Junction 9. The M3 northbound on-slip will pass under the new M3 north bound to A34 link and over the new A34 south bound to M3 Link before merging with the M3 approximately 500m downstream of the existing northbound merge. Access to the Highways England depot is to be provided by a	Figure 3.2

PCF STAGE 1 OPTION	NAME	DESCRIPTION	FIGURE NUMBER (APPENDIX A)
		dedicated link from the proposed Junction 9 roundabout. The existing M3 southbound off-slip diverge will be removed and replaced with a new off-slip, with the diverge located approximately 500m upstream of the current diverge. The new southbound off-slip will then merge with the new A34 to roundabout link to maintain its access to Junction 9. The existing A33/A34 diverge arrangement creates a bottleneck for the A34 traffic as it restricts the free-flow of A34 traffic by effectively narrowing the A34 from two lanes to one before returning to two lanes. The A34 will be re-marked to have two lanes running through the diverge, with a single lane taper diverge to the A33.	
16A	Incremental Delivery – Southbound Links	Option 16A proposes the incremental delivery of only the southbound A34 link associated with Option 14. As with Option 14, the Junction 9 circulatory roundabout will be replaced with an offline dumbbell roundabout; all link roads that access the roundabout will require realignment to this new layout. The alignments of the A34 to M3 southbound link, A34 to roundabout link, A33/A34 diverge and southbound off-slip will be the same as Option 14.	Figure 3.3
16B	Incremental Delivery – Northbound Links	Option 16B proposes the incremental delivery of only the northbound A34 link associated with Option 14. Option 16B retains the current Junction 9 roundabout. The alignments of the M3 northbound to A31 link and A33/A34 diverge will remain the same as option 14. A new merge layout is proposed to connect the Junction 9 roundabout with the A34 northbound. The A34 southbound will be realigned under the new M3 northbound to A34 link to maintain its access to junction 9 and therefore the M3 southbound. The northbound M3 on-slip is to be removed to accommodate the new free-flowing northbound link.	Figure 3.4
18	J9 Throughabout	Option 18 proposes a throughabout link through Junction 9 to provide a direct link for southbound A34 traffic across the junction 9 roundabout to the M3 southbound. The throughabout Junction will be fully signalised and provide improved lane widths which will improve the capacity of the circulatory carriageway. The existing A33/34 diverge will be realigned as in Option 14.	Figure 3.5

4 ENVIRONMENTAL ASSESSMENT METHODOLOGY

4.1 GENERAL APPROACH

4.1.1 This report follows the assessment approach in the DMRB (Design Manual for Roads and Bridges) Volume 11, and relevant Interim Advice Notes (IANs) (including IAN 125/15). Sections 1 and 2 of the DMRB describe the approach of Simple and Detailed Assessment and IAN 125/15 sets out the topic structure for ESRs.

4.2 SCOPING

4.2.1 An initial scoping exercise was undertaken as part of the PCF Stage 1 to determine the level of assessment that was appropriate at this early stage in the design process and to consider whether any topics could be scoped out. The outcomes are reported in this section.

4.2.2 Simple assessments were proposed to provide proportionate assessments of the options, and in view of the limited design information that was available. Due to the nature and variety of options proposed it was not possible to scope any topics out, but this will be considered again as the scheme is progressed and the options developed and refined.

4.2.3 The level of assessment and proposed approach for each topic is summarised in Table 4-1.

Table 4-1: Environmental topics and level of assessment

TOPIC	LEVEL OF ASSESSMENT
Air Quality	Scoping Assessment. High level preliminary assessment based on DMRB, Volume 11, Section 3, Air Quality, May 2007; IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA 207/07); and the Institute for Air Quality Management (IAQM), Guidance on the Assessment of dust from demolition and construction, January 2014. Traffic data is not available so IAN 185/15 and 175/13 cannot be applied.
Cultural Heritage	Simple Assessment. High level preliminary assessment based on the Cultural Heritage Section (Volume 11, Section 3, Part 2) of the Design Manual for Road and Bridges (DMRB) (Highways Agency, 2007); Historic England guidance, Historic Environment Good Practice Advice in Planning Note 3 (Historic England 2015); Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Historic Environment Desk-based Assessment (2014) and CIfA Code of Conduct (2014).
Landscape	**Landscape** Simple Assessment Based on IAN 135/10 Landscape and Visual Effects Assessment (Highways Agency 2010); and the Guidelines for Landscape and Visual Impact Assessment (3rd Edition) (The Landscape Institute and Institute of Environmental Management and Assessment (GLVIA), 2013).

TOPIC	LEVEL OF ASSESSMENT
	Arboriculture (Appendix 7.1) Simple Assessment Base on British Standard BS 5837:2012 *Trees in relation to design, demolition and construction – Recommendations*, British Standards Institute, 2012; and Interim Advice Note 172/13 Ash dieback – Chalara fraxinea, Highways Agency, 2013
Ecology and Nature Conservation	Simple Assessment. Based on the guidelines for Ecological Impact Assessment (EcIA) produced by the Chartered Institute of Ecology and Environmental Management (CIEEM). Prepared with reference to DMRB guidelines (Volume 11, Section 4) and relevant IAN including IAN 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment and IAN 141/11 Assessment of Implications on European Sites.
Geology and Soils	Simple Assessment. High level assessment based on Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11 Geology and Soils, June 1993; CIRIA C552: Contaminated Land Risk Assessment – A Guide to Good Practice.
Materials	Simple Assessment High level assessment based on IAN 153/11 (Highways Agency, 2011) on the environmental assessment of material resources.
Noise and Vibration	Simple Assessment High level assessment of construction phase noise and vibration impacts in accordance with BS5228 -1&2; and qualitative assessment of operational phase impacts following guidance in DMRB.
People and Communities	Simple Assessment High level assessment based on the approach in IAN 125/15, which combines DMRB Volume 11, Section 3, Parts 6 (Land Use), 8 (Pedestrians, Cyclists, Equestrians and Community Effects) and 9 (Vehicle Travellers) into one assessment of People and Communities. The published guidance for these topics has been used.
Road Drainage and the Water Environment	Simple Assessment High level assessment based on DMRB Volume 11, Section 3, Part 10 (HD 45/09).

4.3 STUDY AREA

4.3.1 The study areas used by the technical disciplines reflect the differing nature of the environmental features and assessment requirements. Table 4-2, below outlines the maximum study area used by each discipline. The maximum extent of the area of works required for the scheme (the scheme area) is illustrated in Figure 4.1.

Table 4-2: Maximum study areas used within the technical topics

TECHNICAL TOPIC	STUDY AREA
Air Quality;	→ Scheme area and a 200m area surrounding the scheme area
Noise & Vibration	→ Scheme area and a 300m area surrounding the scheme area (the 300m study area is taken from a rectangle that contains the scheme area)
Geology and Soils	→ Scheme area and a 500m area surrounding the scheme area
Materials	→ Scheme area and waste management facilities in Hampshire
Cultural Heritage	→ Heritage assets - scheme area and 300m area surrounding the scheme area → Setting assessment - scheme area and a 1km area surrounding the scheme area
Water Environment	→ Groundwater - scheme area and a 500m area surrounding the scheme area → Surface water - scheme area and a 1km area surrounding the scheme area
Landscape	→ Arboriculture - scheme area → Landscape receptors - scheme area and 500m area surrounding the scheme area → Visual effects - scheme area and a 1km area surrounding the scheme area → St Catherines Hill viewpoint has been assessed from 4km
People & Communities	→ Land use; community severance; community land; and development land - the scheme area → Tourism and recreation - scheme area and 500m area surrounding the scheme area → Motorised and non-motorised travellers; community severance; and community land - scheme area and a 1km area surrounding the scheme area → Local economy; and housing - Winchester City Council Administrative Area

TECHNICAL TOPIC	STUDY AREA
Nature Conservation	→ Scheme area and a 2km area surrounding the scheme area

4.4 SIGNIFICANCE CRITERIA

4.4.1 The topic chapters provide an assessment of the potential for the scheme to have significant adverse environmental effects. The significance of an effect is a factor of the importance or value of the resource affected, and the magnitude of the impact upon it. Unless otherwise stated, guidance in DMRB Volume 11, Section 2, Part 5, was used to determine the value of an affected resource, the magnitude of impact and the significance of effect. Any use of other guidance has been explained and justified within the relevant assessment topic.

4.4.2 IAN 125/15 stresses that the prediction of significant effects does not require absolute certainty. Instead it is more about taking a reasonable view over likelihood. Furthermore, the determination of significance is only expected to be made using readily available information.

4.4.3 The overall significance of effects was assessed using the matrix in DMRB Volume 11, Section 2 Part 5 (Table 4.2). This approach to assessing significance is used throughout the assessments, unless specified in the topic chapter.The value of environmental resources is attributed under each environmental topic using professional judgement.

4.4.4 The assessment of the magnitude of impact was based on the degree of direct and indirect impact, and whether the impact was permanent or temporary. Criteria for establishing the magnitude of impact and to determine the value of an affected resource was based on DMRB Volume 11, Section 2 Part 5. Any use of other criteria has been explained and justified within the relevant assessment topic.

4.5 MITIGATION AND ENHANCEMENT

4.5.1 Mitigation is defined as ‘measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects’ (DMRB Volume 11, Section 1, Part 7 (HA 218/08)). Enhancement measures are defined as 'measures over and above normal mitigation' (IAN 125/15).

4.5.2 Initial mitigation and enhancement measures have been identified in the topic chapters. Further measures will be identified and adopted as the assessment design progresses.

4.6 CONSULTATION

4.6.1 Highways England have compiled a Communications Plan for the scheme which will be developed further during PCF Stage 2. Consultation with stakeholders will be conducted during PCF Stage 2 when the approach and details of who will be consulted will be established. However, consultation will likely include consulting with the following:

- → Environment Agency
- → Natural England
- → Historic England
- → South Downs National Park Authority
- → Hampshire County Council

5 AIR QUALITY

5.1 INTRODUCTION

5.1.1 This chapter presents a qualitative air quality assessment of the scheme options taking into account the available information concerning existing baseline conditions and the scheme option alignments. The assessment ranks the scheme options from least to most exposed in terms of receptor locations to road sources of air pollutants associated with the scheme.

5.2 ASSESSMENT METHODOLOGY

5.2.1 The existing baseline air quality conditions have been determined by reviewing the information in the public domain published by Winchester City Council (WCC), the Department for Environment, Food and Rural Affairs (DEFRA) and on the Air Pollution Information System (APIS) website[1].

5.2.2 At this stage a high level qualitative assessment has been carried out for the construction phase. It has considered the potential emissions from construction plant and vehicles, dust arising from construction activities and sensitive receptors within 200m of the proposed construction works – in particular the River Itchen Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI)[2].

5.2.3 There is insufficient traffic data at this stage to quantify the air quality impacts; conduct a Compliance Risk Assessment; or apply IAN 185/15. Therefore, a qualitative assessment has been undertaken that is commensurate with DMRB HA 207/07 'Scoping' level of detail.

5.2.4 The assessment:

- → Accounts for the sensitivity of human and Designated Site receptors within 200m of each scheme option alignment, with commentary on potential air quality impacts with regard to changes in source proximity and likely changes in traffic characteristics
- → Ranks scheme options from least to most exposed
- → Highlights any risks, along with potential mitigation

5.2.5 It has not been possible to determine significance of effect at this stage, due to the limited information available.

5.3 BASELINE CONDITIONS

WINCHESTER CITY COUNCIL: LOCAL AIR QUALITY MANAGEMENT

5.3.1 The scheme is not located within an Air Quality Management Area (AQMA). The nearest AQMA is the Winchester City Centre AQMA, which is located approximately 630m to the west of the maximum extent of the works area (shown in Figure 5.1). This AQMA is designated due to exceedances of the Government's Air Quality Strategy (AQS) objective for annual mean nitrogen

[1] http://www.apis.ac.uk/
[2] The River Itchen SSSI includes within it the River Itchen SAC, and covers a much wider area

dioxide[3] (NO_2); this is primarily due to emissions of oxides of nitrogen (NO_x) from road vehicle exhausts.

5.3.2 A recent study report for WCC[4] recommended the declaration of three additional AQMAs within the existing Winchester City Centre AQMA, at St George's Street, Chesil Street and Romsey Road, due to non-compliance with the AQS objective for 1-hour mean NO_2 concentrations[5]. Non-compliance has been indicated by dispersion modelling for conditions in 2014.

5.3.3 WCC undertakes diffusion tube and continuous air quality monitoring. Most of the monitoring sites are roadside NO_2 diffusion tubes located within the city centre. WCC has two continuous monitoring sites for NO_2 and PM_{10} (particles of 10 micrometres diameter or less); one is at roadside on St George's Street in the city centre, and the other (considered by WCC to be representative of urban background conditions) is at Godson House, Lawn Street. These monitoring sites are shown in Figure 5.1, and the annual mean NO_2 concentrations for 2014 are indicated. Concentrations of PM_{10} have been well within AQS objectives in recent years.

5.3.4 The nearest monitoring site to the M3 is at the roadside on the B3404 Alresford Road (WCC Site 16). This is approximately 60m to the west of the M3 central reserve just before the Alresford Road Spitfire Bridge over the motorway, which is in a cutting. The annual mean NO_2 concentration at this site[6] in 2014 was 39.7 micrograms per cubic metres (µg/m^3), and therefore below the EU limit value. Similar concentrations have been determined for previous years (since 2008) with the highest concentration of 40.9µg/m^3 occurring in 2012[7] and therefore above the EU limit value. No clear long-term trend is apparent from the data. The nearest relevant location at which a sensitive receptor may be exposure to these concentrations, is at residential premises located 10m the west and set further back from the Alresford Road than the monitoring site.

DEFRA: POLLUTION CLIMATE MAPPING

5.3.5 The area around Winchester, and the scheme extent, is located within a DEFRA zone of non-compliance with EU limit value for annual mean NO_2 (40µg/m^3) and compliance with all other limit values[8] (South East Zone UK0031, DEFRA, 2014). The evidence base regarding compliance is provided by UK statutory monitoring networks, and supplemented by Pollution Climate Mapping (PCM) modelling.

5.3.6 PCM data for 2014 has been obtained from the DEFRA UK Air website[9]. The data indicates that roadside annual mean NO_2 concentrations for the M3 to the north and south of Junction 9 in the range 40 - 50µg/m^3 (i.e. exceeding the EU limit value). This is illustrated in Figure 5.1. Other roads within the study are not included in the PCM model. There are no PCM model road links within the AQMA.

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[3] The AQS objective for annual mean NO_2 is 40µg/m^3 (this is numerically the same as the EU Limit Value for annual mean NO_2)
[4] Winchester City Council 'Detailed Assessment and Associated Studies', February 2016 (http://www.winchester.gov.uk/environment/pollution/air-quality/)
[5] The AQS objective for 1-hour mean NO_2 is 200µg/m^3 not to be exceeded more than 18 times in a calendar year (this is numerically the same as the EU Limit Value for 1-hour mean NO_2)
[6] WCC Air Quality Summary 2014 (http://www.winchester.gov.uk/environment/pollution/air-quality/)
[7] WCC Air Quality Summary 2012 (Revised) (http://www.winchester.gov.uk/environment/pollution/air-quality/)
[8] DEFRA, Air Pollution in the UK 2014 – Compliance Assessment Summary (http://uk-air.defra.gov.uk/library/annualreport/index)
[9] http://uk-air.defra.gov.uk/data/gis-mapping

DEFRA: BACKGROUND CONCENTRATION MAPPING

5.3.7 DEFRA provides estimates of background annual mean pollutant concentrations across the country on a 1 by 1 km grid[10]. The highest background concentrations tend to occur in grid squares with the greatest density of sources, such as urban areas, and including the Strategic Road Network (SRN). Background concentrations of NO_2 and NO_x in 2014 are illustrated in Figure 5.1 and Figure 5.2 respectively. The highest background concentrations within the study area occur in the vicinity of M3 Junction 9.

5.3.8 Data from the WCC Godson House urban background continuous analyser suggests that the actual background annual mean NO_2 concentration may have been higher in the urban area in 2014 than suggested by the DEFRA background mapping. The monitored annual mean NO_2 is 24µg/m^3 compared to DEFRA's estimate of 17µg/m^3. It is important to note that the Godson House site is within 25m of the B3331 Friar's Gate and so concentrations measured at this site could be noticeably affected by emissions from traffic on this road. The true urban background concentration for the centre of Winchester in 2014 is therefore likely to have been between 17 and 24µg/m^3.

APIS: DESIGNATED SITES SENSITIVE TO CHANGES IN AMBIENT NO_X AND NITROGEN DEPOSITION

5.3.9 The only Designated Sites within the study area are the River Itchen SAC and SSSI.

5.3.10 The APIS website provides data regarding the sensitivity of Designated Sites to air pollution. The ambient annual mean NO_x concentrations are of relevance to the scheme, particularly whether or not these exceed the Critical Level of 30µg/m^3 (set to protect sensitive vegetation). In addition, annual nutrient nitrogen deposition rates in relation to Critical Loads to protect habitat supporting protected species need to be considered. APIS gives estimates of annual mean NO_x concentrations and nitrogen deposition for Designated Sites over a 5 by 5 km grid (whereas DEFRA gives NO_x concentrations at a higher 1 by 1 km grid resolution).

5.3.11 Nitrogen deposition rates below the lower Critical Load, provide certainty that there is minimal risk to the associated habitat. Consequently, the lower Critical Load is used as a screening benchmark. Nitrogen deposition rates between the lower and upper Critical Load values indicate that there is some risk to the habitat. Nitrogen deposition rates above the upper Critical Load indicate that there is clear risk of harm.

5.3.12 DEFRA background concentration data for annual mean NO_x in 2014 indicate that background NO_x concentrations within the River Itchen SAC/SSSI are likely to be below the Critical Level (between 20 and 30 µg/m^3, as illustrated in Figure 5.2). Annual mean NO_x concentrations are likely to be closer to or above the Critical Level within 200m of the existing A34 and M3 alignments. This is indicated by the background NO_x concentration of 30.6µg/m^3 in the vicinity of the M3 Junction 9 gyratory (the River Itchen SAC and SSSI is over 300m away from this location).

5.3.13 The River Itchen SAC has one feature that has been assigned Critical Loads, namely the northern wet heath (*Erica tetralix* dominated wet heath habitat), supporting the feature the Southern Damselfly (*Coenagrion mercurial*). This has lower and upper critical loads of 10 and 20kg N/ha/year respectively. The current estimated weighted average nitrogen deposition for this feature is 16.5kg N/ha/year, which indicates that there is some existing risk to this habitat. No further potentially sensitive features associated with the SAC have been assigned Critical Loads.

[10] http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011

5.3.14 The River Itchen SSSI also includes ecological features that are sensitive to changes in nitrogen deposition, including:

- *Coenagrion mercuriale* - Southern Damselfly. The lower and upper Critical Loads that apply relate to northern wet heath (*Erica tetralix* dominated wet heath) and are 10 and 20 kg N/ha/year respectively. The current estimated weighted average nitrogen deposition is 17 kg N/ha/year, which is within the Critical Load range towards the upper end.
- Broad-leaved, mixed and yew woodland (*Alnus glutinosa - Carex paniculata* woodland, *Alnus glutinosa - Urtica dioica* woodland, and *Salix cinerea - Galium palustre* woodland). The lower and upper Critical Loads that apply relate to broadleaved deciduous woodland and are 10 and 20 kg N/ha/year respectively. The current estimated weighted average nitrogen deposition is 28.3 kg N/ha/year, which exceeds the upper Critical Load.
- Fen, marsh and swamp (*Juncus subnodulosus - Cirsium palustre* fen meadow). The lower and upper Critical Loads that apply relate to rich fens and are 15 and 30 kg N/ha/year respectively. The current estimated weighted average nitrogen deposition is 17 kg N/ha/year, which is within the Critical Load range towards the lower end.
- Neutral grassland (*Cynosurus cristatus - Centaurea nigra* grassland, *Cynosurus cristatus - Caltha palustris* grassland, *Cynosurus cristatus - Caltha palustris* grassland, and *Cynosurus cristatus - Centaurea nigra* grassland). The lower and upper Critical Loads that apply relate to low and medium altitude hay meadows and are 20 and 30 kg N/ha/year respectively. The current estimated weighted average nitrogen deposition is 17 kg N/ha/year, which is within the Critical Load range towards the lower end.

5.3.15 No other potentially sensitive features associated with the SSSI have been assigned Critical Loads.

5.4 REGULATORY AND POLICY FRAMEWORK

RELEVANT LEGISLATION

5.4.1 The Air Quality (England) Regulations 2000 No.928 set air quality objectives for local authorities[11]. These objectives are included in the current AQS, which was first established by the Government in 1997 in accordance with the requirements of Part IV of the Environment Act 1995[12]. The Environment Act also introduced the system of Local Air Quality Management (LAQM) in pursuit of achieving the air quality objectives (commonly referred to as 'AQS objectives'). Local authorities are responsible for LAQM and are required to regularly review and assess local air quality and report to the DEFRA. Where a local authority identifies non-compliance with one or more AQS objectives it is required to declare an AQMA and produce an Air Quality Action Plan (AQAP) to work towards achieving the relevant AQS objective(s).

5.4.2 The Air Quality Standards Regulations 2010 No.1001 set EU limit and target values for pollutants[13]. Whilst numerically the same in terms of concentration statistics as the air quality objectives within the Air Quality (England) Regulations 2000, compliance with the EU limit values for pollutants is mandatory and this is ultimately the responsibility of the Secretary of State. Failure to comply will result in infraction proceedings by the EU with potentially a substantial financial penalty. These regulations are therefore important when considering improvements to the strategic road network, including this scheme.

[11] http://www.legislation.gov.uk/uksi/2000/928/contents/made
[12] http://www.legislation.gov.uk/ukpga/1995/25/contents
[13] http://www.legislation.gov.uk/uksi/2010/1001/contents/made

5.4.3 UK legislation includes regulations defining limit values, objectives and targets (i.e. criteria) for air pollutants. These criteria are set to protect public health and sensitive vegetation/ecosystems. The relevant criteria are given in Table 5-1. There are no criteria for dust and nitrogen deposition rates.

Table 5-1: Relevant air quality criteria for highways schemes

POLLUTANT	CONCENTRATION ($\mu g/m^3$)	MEASURED AS:	NUMBER OF EXCEEDANCE ALLOWED IN A CALENDAR YEAR
NO_2	40	Annual mean	None
	200	1-hour mean	No more than 18
NO_x	30	Annual mean	None
PM_{10}	40	Annual mean	None
	50	24-hour mean	No more than 35
$PM_{2.5}$	25	Annual mean	None

RELEVANT POLICY

5.4.4 At national level, relevant policy concerning air quality and the scheme is given in the Government's National Policy Statement for National Networks (NPSNN, December 2014)[14].

5.4.5 The NN NPS indicates that the Secretary of State should refuse consent for schemes where

"…after taking into account mitigation, the air quality impacts of the scheme will: result in a zone / agglomeration which is currently reported as being compliant with the Air Quality Directive becoming non-compliant; or affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision" (Paragraph 5.12 – 5.13).

5.4.6 The Hampshire Local Transport Plan 2011 – 2031 (the LTP)[15] commits to continued engagement with Highways England to deliver improvements in the transport network, and working with the local authorities to deliver AQAPs to bring about improvements in air quality within AQMAs.

5.4.7 At local level, the Winchester Town Access Plan (TAP)[16] seeks to reduce traffic in the city centre and improve air quality (as well as public access). The scheme design should seek to support this aim. WCC's AQAP pre-dates the LTP and TAP but WCC currently refers to these as key to effecting improvements in local air quality[17].

5.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

CONSTRUCTION PHASE

5.5.1 The Construction Environmental Management Plan (CEMP) will incorporate appropriate measures to mitigate emissions from construction works area, including measures that take into

[14] https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[15] http://www3.hants.gov.uk/transport/local-transport-plan.htm
[16] http://www3.hants.gov.uk/transport-planning/taps/tap-winchester.htm
[17] http://www.winchester.gov.uk/environment/pollution/air-quality/

account the sensitivities of off-site locations Particular care will be required when planning and implementing measures to minimise fugitive dust emissions from site areas located near to the River Itchen SAC and SSSI.

OPERATIONAL PHASE

5.5.2 The baseline PCM data indicates that roadside annual mean NO_2 concentrations for the M3 to the north and south of Junction 9 exceed the EU limit value. However, there are no roadside locations where the public is likely to be regularly exposed to exceedances.

5.5.3 Generally, scheme designs that minimise the occurrence of traffic congestion are likely to support improvements in ambient air quality locally and potentially regionally, however without traffic data it is not possible to quantify these improvements. Progressive replacement of older, more polluting vehicle technologies with those that are less polluting will also bring about improvements. However, significant improvements are unlikely to be possible if traffic congestion is allowed to persist and worsen. The design should seek to minimise the likelihood of future traffic congestion on Easton Lane, to avoid exacerbating conditions within the Winchester City Centre AQMA, and ensure that WCC would not need to extend the AQMA any further along Easton Road towards the M3 Junction 9.

5.5.4 The design should also seek to minimise the likelihood of future congestion on the approach to the northbound M3 Junction 9 off-slip, to prevent the exceedances of the annual mean NO_2 limit value that are indicated by the 2014 PCM data extending into the adjacent residential areas off Longfield Road and Turnpike Down / Spitfire End.

5.5.5 In relation to the River Itchen SAC and SSSI, the design should aim to minimise the spatial extent over which impacts are likely to occur within the Designated Sites. There is the opportunity to do this where the A33 splits off from the A34 Winchester By-Pass to the south of Abbots Worthy and Headbourne Worthy.

5.5.6 Highways England is undertaking annual mean NO_2 monitoring in the vicinity of the schemes. When available, the relevant data will to be provided by the Air Pollution Roads Board and will be reviewed to determine if further monitoring is necessary. The results of the monitoring will be used to inform the air quality assessment at subsequent PCF Stages.

5.6 OVERALL ASSESSMENT

CONSTRUCTION PHASE

5.6.1 The risk of a significant effect, either in terms of human receptors or Designated Site receptors, will be minimised by appropriate measures in the CEMP that will be effectively applied throughout the construction phase.

OPERATIONAL PHASE

HUMAN RECEPTORS

5.6.2 The scheme options have been assessed according to the proximity of human receptors within 200m of scheme option alignment centrelines, and with consideration of the likely changes in traffic characteristics. The scheme options will have negligible impacts on ambient annual mean NO_x and nitrogen deposition beyond 200m from the alignment (based on the assessment approach in the DMRB).

5.6.3 Figures 5.3 to 5.8 illustrate relevant receptor locations in relation to each scheme option. The options have been ranked from least to most exposed in terms of receptor locations to road sources of air pollutants associated with the scheme. The results are given in Table 5-2.

5.6.4 All 'with scheme' options are likely to improve traffic movements compared to the 'without scheme' scenario and so, provided traffic attraction is minimal, there is scope for air quality benefits at human receptors to be realised within the study area, albeit the benefits are potentially marginal.

5.6.5 With Option 11 there would be the least exposure within 50m. Residential premises in the Abbots Worthy area would benefit in this respect due to the shift in centreline of the A34/A33 (see Figure 5.4), although any benefit experienced is likely to be marginal. The other options are very similar to each other. On the basis of receptor proximity alone, the 'without scheme' option ranks jointly as second, because congestion issues would not be addressed under this scenario it should be viewed as the least desirable option. All 'with scheme' options are preferable to the 'without scheme' option.

Table 5-2: Options ranked by numbers of human receptors within 200m of route alignments

OPTION	WITHIN 50M	WITHIN 50-100M	WITHIN 100-150M	WITHIN 150-200M	TOTAL WITHIN 200M	RANK (LEAST TO MOST EXPOSED)
11	6	67	78	108	259	1
16B	9	63	80	108	260	2
18	9	63	80	108	260	2
Without scheme	9	63	80	108	260	2
14	9	63	81	107	260	3
16A	9	63	81	107	260	3

DESIGNATED SITE RECEPTORS

5.6.6 The assessment has considered impacts on Designated Site receptors within 200m of the route alignments. The scheme options will have negligible impacts on ambient annual mean NO_x and nitrogen deposition beyond 200m from the alignment. Figures 5.3 to 5.8 illustrate the relevant receptor locations in relation to each scheme option.

5.6.7 The options have been ranked from least to most exposed in terms of receptor locations to road sources of air pollutants associated with the scheme on the basis of the changes in road alignment, and the results are given in Table 5-3.

5.6.8 All 'with scheme' options are likely to improve traffic movements compared to the 'without scheme' scenario. Therefore, provided traffic attraction is minimal, there is scope for air quality benefits at Designated Site receptors to be realised within the study area, albeit potentially marginal.

5.6.9 Option 11 impacts on the smallest areas of the SAC and SSSI designations and in these terms is ranked least exposed. The designated sites would be most exposed under option 18 and the 'without scheme' scenario.

Table 5-3: Options ranked by areas of designated sites within 200m of route alignments

OPTION	AREA OF RIVER ITCHEN SSSI WITHIN 200M (M^2)	AREA OF THE RIVER ITCHEN SAC WITHIN 200M (M^2)	TOTAL AREA WITH IMPACTS (M^2)	RANK (LEAST TO MOST EXPOSED)
11	366,594	47,746	414,340	1
14	408,562	48,655	457,217	2
16B	409,761	48,734	458,495	3
16A	410,430	48,965	459,395	4
18	413,112	49,201	462,313	5
Without scheme	413,112	49,201	462,313	5

5.6.10 Overall, Option 11 is likely to be the most preferable in terms of receptor exposure to air pollutant sources associated with the scheme. Option 18 is least preferable.

5.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

5.7.1 It has not been possible to define the study area beyond a distance of 200m metres from the maximum extent of works (shown in Figures 5.1 and 5.2) as suitable operational traffic data is not available at this early stage of the scheme development. When traffic data is available (expected in PCF Stage 2) the affected road network will be defined and impacts will be considered up to 200m from the affected road network. This assessment considered impacts within 200m of the maximum extent of the scheme works. It is possible that impacts will need to be considered over a wider area due to changes in traffic with the scheme, particularly consideration will be given to the potential for changes in the Winchester City Centre AQMA.

5.7.2 It has not been possible to quantify the schemes air quality impacts without traffic data, or determine whether the impacts are likely to give rise to a significant effect. However, with the potential air quality improvements brought about by the proposed scheme given the decrease in congestion, it is considered to align with the KPI's set out by Highways England to promote more sustainable travel, deliver better environmental outcomes and to reduce the average delay time.

5.7.3 The full extent of the affected road network and determination of any significant effect will be undertaken in accordance with DMRB HA 207/07 procedure at the subsequent PCF Stage when the required traffic data are available.

5.8 SUMMARY

5.8.1 The risk of a significant construction air quality effect, either in terms of human receptors or designated scheme receptors, will be minimised by appropriate measures in the CEMP, which will be applied throughout the construction phase.

5.8.2 During operation, Option 11 is likely to result in fewest adverse air quality impacts, as it has fewest human receptors in close proximity (50m) to the option alignment. Residential premises in the Abbots Worthy area would experience an improvement in air quality, due to the shift in centreline of the A34/A33, although this benefit is likely to be marginal. The other options will have a very similar impact, but can be ranked from lowest to highest in terms of exposure to air pollutants: with Option 11 followed by 16B, 18, 14 and 16A.

5.8.3 Option 11 is likely to result in the least impact on SAC and SSSI designations as traffic emissions will affect smaller areas of the designated sites than other options on the basis of the changes in road alignment. Option 11 is followed by options 14, 16B, 16A and 18, in terms of the options least likely to result in adverse impacts on the SAC and SSSI.

5.8.4 All 'with scheme' options are likely to improve traffic movements compared to the 'without scheme' scenario. They all have the potential to result in air quality benefits at human receptors and designated sites within the study area, dependent upon the trip generation and the redistribution of traffic as a result of the scheme.

6 CULTURAL HERITAGE

6.1 INTRODUCTION

6.1.1 This chapter provides a high level assessment of the potential for the scheme options to affect both below-ground archaeological remains and earthworks, and the setting of heritage assets.

6.2 ASSESSMENT METHODOLOGY

6.2.1 A Simple Assessment has been undertaken, as defined by DMRB guidance (Volume 11, Section 3, Part 2 HA 208/07). This approach either provides an appropriate understanding of the effects of the scheme options, or identifies the need for a Detailed Assessment.

6.2.2 This chapter presents an assessment of the physical impact of the scheme options on the cultural heritage resource. The cultural heritage resource includes all known statutory designated assets and non-designated assets. The setting (context) of these assets was excluded. It is recommended that a setting assessment is undertaken at PCF Stage 2.

DATA COLLECTION

6.2.3 The following sources were consulted during the data-gathering process:

- The Historic Environment Record (HER) held by Hampshire County Council;
- National Heritage List for England (NHLE) as maintained by Historic England.

TERMINOLOGY

6.2.4 The technical terminology applied to the assessment process in this document is based on that contained within the Cultural Heritage Section (Volume 11, Section 3, Part 2) of the DMRB (Highways Agency, 2007) and Historic England guidance The Setting of Heritage Assets, Good Practice Advice in Planning: 3 (2015).

POTENTIAL IMPACT

6.2.5 The level of harm to cultural heritage significance of the asset, or the magnitude of the impact as prescribed by DMRB, is the basis of assessing impact. In order to assess the level of harm or potential impact of the scheme on built heritage or buried archaeological remains, consideration has been afforded to:

- Assessing any impact and the likely significance of the effects arising from the scheme options
- Reviewing the evidence for past impacts that may have affected the archaeological sites of interest identified during the desk-based assessment
- Outlining suitable mitigation measures, where possible at this stage, to avoid, reduce, or remedy adverse impacts

IMPORTANCE OR SENSITIVITY OF HERITAGE ASSETS

6.2.6 Initially, the sensitivity or importance of a heritage asset is judged in a neighbourhood, local, regional, national and international context, which results in the cultural heritage sensitivity of the asset being determined (Table 6-1).

Table 6-1: Criteria used to determine importance/sensitivity of heritage assets

CULTURAL IMPORTANCE / SENSITIVITY	CRITERIA
Statutory Designated Assets	
International (Very High)	→ World Heritage Sites → Sites of International Importance
National (High)	→ Scheduled Monuments → All Grades of Listed Buildings → Registered Parks and Gardens → Conservation Areas → Areas of Archaeological Importance → Protected wreck sites → Registered battlefields → Non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments
Non-designated Assets	
Regional / County (Medium)	→ Locally listed buildings → Locally listed gardens → Archaeological sites and remains which contribute to regional research objectives → Historic buildings/structures that contribute to regional character either through architectural interest or a specific function → Assets which contribute to regional or cultural understanding of the area
Local / Borough (Low)	→ Archaeological sites and remains with a local or borough interest for education, cultural appreciation → Assets which contribute to local or cultural understanding of the area
Neighbourhood (Negligible)	→ Relatively numerous types of remains, of some local importance → Isolated findspots with no context → Areas in which investigative techniques have revealed no, or minimal, evidence of archaeological remains, or where previous large-scale disturbance or removal of deposits can be demonstrated
Uncertain / Potential	→ Potential archaeological sites for which there is little information. It may not be possible to determine the importance of the site based on current knowledge. Such sites are likely isolated findspots, place names or cropmarks identified on aerial photographs

6.2.7 Table 6-1 is a general guide to the attributes of heritage assets and it should be noted that not all the qualities listed need to be present in every case. The cultural heritage sensitivities of asset within the 1km study area are presented below (Table 6-2). Professional judgement is used in balancing the different criteria.

Table 6-2: Importance/sensitivity of the heritage assets identified within the 1km study area

CULTURAL IMPORTANCE / SENSITIVITY	ASSETS
Statutory Designated Assets	
International (very high)	None
National (high)	All scheduled monuments, all grades of listed building, the conservation areas, the locally listed parks and gardens and the water meadows
Non-designated Assets	
Regional / County (medium)	The majority of the prehistoric period and other early remains such as the Early Medieval period assets will be of regional or county importance
Local / Borough (low)	Most of the post-medieval remains will be of local importance. The war memorial is of local importance
Neighbourhood / Negligible	N/A
Uncertain / Potential	Previously unrecorded assets

6.3 BASELINE CONDITIONS

6.3.1 A total of 214 heritage assets were identified within the 1km study area (source: HER) including:

- Four Scheduled Monuments
- Two Grade I Listed Buildings
- 12 Grade II* Listed Buildings
- 76 Grade II Listed Buildings
- Four Conservation Areas
- 11 Locally listed historic parks and gardens
- 10 Water Meadows of national significance
- 95 non-designated heritage assets

6.3.2 The heritage assets are detailed in full within Appendix 6.1. Figures 6.1 to 6.3 show the assets in relation to the scheme area.

6.3.3 There have been previous archaeological investigations undertaken in the scheme area and study area, which indicate that there is a potential for previously unrecorded archaeology from the prehistoric to the modern periods to be present. There was a prevalence of prehistoric archaeology recorded during the original construction of the M3, which suggests that the potential for prehistoric archaeology to be present is very high.

6.4 REGULATORY AND POLICY FRAMEWORK

6.4.1 The relevant policy reflects the types of heritage assets that are present within the scheme extent and surrounding study area. The policies have also been used to inform the mitigation strategies.

6.4.2 The policies within Appendix 2.1 will influence the consideration of the significance (or value) of the heritage assets in cultural heritage terms, the consideration of the significance of setting to the importance of the assets, and the level of potential harm to the historic assets and their setting.

6.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

6.5.1 Winchester City Council planning policy requires that adequate provision is made for a programme of archaeological investigation, excavation and recording before, or during, development. It is proposed that, where viable, preliminary archaeological investigations are undertaken within the preferred scheme area to establish the nature, extent and survival of hitherto unknown below-ground archaeological remains at PCF Stage 3. This is likely to comprise a geophysical survey followed by an appropriate form of intrusive investigation or monitoring. Additionally, an archaeological watching brief should be maintained during any geotechnical ground investigations.

6.5.2 Historic England (2015) guidelines for mitigation of the impact of a development on the setting of a heritage asset suggest that in the first instance impacts are best mitigated either by relocation of the development or changes to its design. Where relocation of the development is not possible, good design alone may be capable of reducing the harm. High quality design will be particularly important for the junction options that may have an adverse effect on the setting of heritage assets. A setting assessment to assess the potential impacts of the scheme on the setting of designated heritage assets including the Scheduled Monuments, Listed Buildings, Locally Listed Parks and Gardens and Conservation Areas needs to be undertaken before an appropriate scheme of mitigation can be devised where applicable and in accordance with Local Policy guidelines.

6.5.3 Current legislation draws a distinction between archaeological remains of national importance and other remains considered to be of lesser significance. Those perceived to be of international and national importance may require preservation in situ, whilst those of lesser significance may undergo preservation by record, where they are of Regional/County or Local/Borough significance. There are no sites of international importance within 1km of the scheme, but there are sites of national importance that may require preservation in situ.

6.6 OVERALL ASSESSMENT

6.6.1 The scheme will have no physical impacts on the statutory designated assets within the 1km study area. The scheme options have some potential to have physical impacts upon non-designated below-ground archaeological remains and earthworks. Any works that necessitate the movement of previously undisturbed ground have the potential to have an adverse physical impact upon heritage assets that survive within the footprint of the scheme options. Potential disturbance will be caused during the excavation of new roads and junction improvements in addition to any service trenches, topsoil stripping for compounds, landscaping features and drainage ponds.

6.6.2 Many of the assets noted in the HER, for this search area, were recorded during the archaeological survey undertaken during the original M3 construction and therefore it is likely that many of the features recorded, especially those of a linear nature, still exist outside of the current highway alignment.

6.6.3 The majority of the scheme options could potentially have up to a large adverse effect on non-designated below-ground archaeological remains and earthworks, however, these can largely be reduced to a neutral effect with mitigation (as summarised in Table 6-3 and 6-4). Only those assets for which there will be a significant (that is moderate or above) impact prior to mitigation have been included.

6.6.4 A setting assessment has not been undertaken at this stage, so it has not been possible to undertake a comparative assessment of the effects on setting or discount the possibility of significant effects.

Table 6-3: Magnitude of impact and significance of effect on assets only affected by Option 11

HERITAGE ASSET NAME / NUMBER	SENSITIVITY OF THE ASSET	DEGREE OF HARM (MAGNITUDE OF IMPACT)	SIGNIFICANCE OF EFFECT WITHOUT MITIGATION	SIGNIFICANCE OF EFFECT WITH MITIGATION	DURATION OF EFFECT
MWC553	Medium (Regional)	Moderate Adverse (moderate harm)	Moderate	If any remains associated with this asset are identified through archaeological investigation they will require a programme of recording. The Moderate Adverse effect will be reduced to Neutral through appropriate investigation that results in preservation by record	Permanent
MWC2313	Medium (Regional)	Major Adverse – potential loss of entire site (Substantial harm)	Large	If any remains associated with this asset are identified through archaeological investigation they will require a programme of recording. The Large Adverse effect will be reduced to Neutral through appropriate investigation that results in preservation by record	Permanent
MWC2942	Medium (Regional)	Unknown	Unknown	No definitive location of asset, potential impacts will need to be reassessed further to a scheme of investigative fieldwork	Permanent
Water meadow 196	High (National)	Major Adverse – potential partial loss of asset	Large /Very Large	Nationally significant remains should be avoided; mitigation should be achieved through design.	Permanent
Water meadow 198	High (National)	Major Adverse – potential partial loss of asset	Large /Very Large	Nationally significant remains should be avoided; mitigation should be achieved through design.	Permanent

Table 6-4: Magnitude of impact and significance of effect on assets affected by Options 11, 14, 16A and 16B

HERITAGE ASSET NAME / NUMBER	SENSITIVITY OF THE ASSET	DEGREE OF HARM (MAGNITUDE OF IMPACT)	SIGNIFICANCE OF EFFECT WITHOUT MITIGATION	SIGNIFICANCE OF EFFECT WITH MITIGATION	DURATION OF EFFECT
MWC552	Medium (Regional)	Potentially Major Adverse (Substantial Harm) for Options 11, 14, 16A and 16B	Large	If any remains associated with this asset are identified through archaeological investigation they will require a programme of recording. The Large Adverse effect will be reduced to Neutral through appropriate investigation that results in preservation by record	Permanent
MWC6180	Medium (Regional)	Potentially Major Adverse (Substantial Harm) for Options 11, 14, 16A and 16B	Large	If any remains associated with this asset are identified through archaeological investigation they will require a programme of recording. The Large Adverse effect will be reduced to Neutral through appropriate investigation that results in preservation by record	Permanent
MWC3058	Medium (Regional)	Potentially Major Adverse (Substantial Harm) for Options 11, 14, 16A and 16B	Large	If any remains associated with this asset are identified through archaeological investigation they will require a programme of recording. The Large Adverse effect will be reduced to Neutral through appropriate investigation that results in preservation by record	Permanent
MWC6201	Medium (Regional)	Potentially Major Adverse (Substantial Harm) for Options 11, 14, 16A and 16B	Large	If any remains associated with this asset are identified through archaeological investigation they will require a programme of recording. The Large Adverse effect will be reduced to Neutral through appropriate investigation that results in preservation by record	Permanent
MWC2312	Medium (Regional)	Potentially Major Adverse (Substantial Harm) for Options 11, 14 and 16A. Not impacted by Option 16B	Large	Full extent of asset is unknown prior to investigative fieldwork. The Large Adverse effect will be reduced to Neutral through appropriate investigation that results in preservation by record	Permanent
MWC2298	Unknown	Potentially Major Adverse (Substantial Harm) for Options 11, 14 and 16A. Not impacted by Option 16B	Large	Extent and sensitivity of the asset unknown prior to investigative fieldwork. Complete destruction of the asset could be as high as Large Adverse effect, but could be mitigated through preservation by record reducing the effect to Neutral.	Permanent
Hitherto Unknown buried archaeological remains	Regional (Medium)	Major Adverse (Substantial Harm) for Options 11, 14, 16A and 16B	Moderate/ Large Adverse	The Moderate/Large Adverse effect is likely to be reduced to Neutral through appropriate archaeological investigation which would lead to preservation by record.	Permanent

OPTION 18

6.6.5 Due to the work previously undertaken during the original construction of the junction it is unlikely that the necessary works will create any additional impact to buried archaeology. The additional

sections of carriageway will be at the same elevation as the existing road layout and therefore this option is unlikely to have any impact on the setting of designated or locally listed assets.

6.6.6 Although construction works may create temporary impacts on setting, it is not envisaged that there will be any permanent operational impacts. The works involve creating additional carriageway at a height consistent with the road layout already in existence. Therefore there are not envisaged to be visual impacts, in particular those caused by changes to the skyline. Changes in noise, vibration and lighting will be assessed when further information becomes available and with input from the associated disciplines.

COMPARISON OF OPTIONS

6.6.7 On the basis of the locations of landtake, Option 11 would have the greatest potential physical impact, in particular impacting on nationally significant historic assets, which should be avoided. Options 14, 16A and 16B all have an as yet unquantifiable potential for adverse impact on the historic environment resource, although the physical impacts can be mitigated to neutral through preservation by record. Option 18 has the least adverse effect and is considered to have only negligible impacts on the historic environment resource.

6.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

6.7.1 A Setting Assessment was not undertaken for this stage of the assessment. Therefore, the impact of the scheme options on the setting of designated and locally listed heritage assets remains unknown.

6.7.2 The potential for impacts on below-ground archaeology is likely to require further assessment as the physical extent of the proposed options is developed at PCF Stage 2. Additionally, the assessments will be refined further through a scheme of investigative survey and fieldwork for the preferred option at PCF Stage 3.

6.8 SUMMARY

6.8.1 Options which impact on nationally significant heritage assets should be avoided where possible, however, if unavoidable, they would require careful mitigation through the design. All other physical impacts to non-designated heritage assets can be mitigated through preservation by record.

6.8.2 Options 11, 14, 16A and 16B all have the potential for direct physical construction impacts on known and previously unrecorded buried archaeology and earthworks.

6.8.3 Option 11 could potentially have a physical impact on nationally significant water meadows and therefore has the greatest potential for harm due to direct physical impacts on nationally significant heritage assets.

6.8.4 Options 14, 16A, and 16B are similar in terms of their potential for harm, they are however considered to be less adverse than Option 11 as they cover a smaller area and the effects can be mitigated for. Options 14, 16A and 16B have the potential to have an adverse impact on non-designated buried archaeology and earthworks of up to regional significance, however, direct qualitative comparisons between them cannot be made without more detailed assessment.

6.8.5 A Setting Assessment should be undertaken at PCF Stage 2 to assess any potential impacts of the options on designated and nationally significant heritage assets. Further stages of assessment would typically include both non-intrusive geophysical survey and intrusive archaeological investigation such as trial trenching, both of which would occur at PCF Stage 3.

6.8.6 Option 18 is considered to have a neutral effect on the historic environment. Due to the work previously undertaken during the original construction of the junction it is unlikely that the necessary works will create any additional impact to buried archaeology. The additional sections of carriageway will potentially be at the same elevation, or slightly higher, than the existing road layout and therefore this option is unlikely to have any impact on the setting of designated or locally listed assets.

6.8.7 There would be no further impacts on heritage and historic resources during the operational phase of the options.

7 LANDSCAPE AND VISUAL EFFECTS

7.1 INTRODUCTION

7.1.1 This chapter provides a high level evaluation of the existing landscape resources and visual receptors in the scheme extent and surrounding area.

7.1.2 The scheme extent is located adjacent to and partially within, the SDNP. The scheme is located in a transitional landscape where the Winchester downland merges into the Itchen river valley. The landscape context of the scheme area is shown on Figure 7.1 Landscape and Visual Receptors. The local landscape has been substantially altered by the existing highways estate and urbanisation. Local character is dominated by roads and associated infrastructure including bridges, cuttings, slips and signage. Figure 7.2 illustrates severance due to highways infrastructure in the local landscape.

Figure 7-2: View south from Junction 9 towards Magdalen Hill Down and the B3404 road bridge over the M3 (formerly Spitfire Bridge).

7.1.3 This chapter should be read in conjunction with Appendix 7.1 – Arboricultural Assessment.

7.1.4 The landscape and visual baseline work carried out at the PCF Stage 1 ESR scoping stage indicated that a Detailed Assessment may be required at PCF Stage 2 due to anticipated significant effects on the SDNP, some Public Rights of Way (PRoW), and residential receptors as a result of the scheme.

7.1.5 In order to provide a proportionate assessment of the scheme at PCF Stage 1, this ESR provides a simple assessment of the landscape and visual effects associated with the scheme options. The ESR has been informed by a landscape and visual site survey that was conducted in May 2016. Viewpoint photography carried out during the site visit is provided in Figures 7.3 to 7.11.

7.1.6 This ESR has been prepared to inform the option identification, and additional landscape and visual assessment will be required at PCF Stage 2 and Stage 3. Recommendations for the level of landscape and visual assessments that would be appropriate for each scheme option are included in Section 7.5 at the end of this chapter. A summary of the necessary mitigation measures to help shape the final design are included in Section 7.4.

7.2 ASSESSMENT METHODOLOGY

7.2.1 Landscape and visual effects are related but distinct topics so are considered and assessed separately. Effects on the landscape arise from a development causing direct changes to the physical elements of the landscape, affecting its features, character and quality, and more widely, from indirect effects of the development on the character and quality of the surrounding landscape and townscape. Visual effects arise where a development changes the character and quality of the views that people may enjoy.

7.2.2 The assessment follows the principles of the following guidance documents:

- ‘Interim Advice Note (IAN) 135/10 Landscape and Visual Effects Assessment’, Highways Agency, 2010[18]
- ‘Guidelines for Landscape and Visual Impact Assessment (3rd Edition)’ (GLVIA 3), LI & IEMA, 2013[19]

7.2.3 Receptor sensitivity, magnitude of change and evaluation of the significance of the landscape and visual effects arising from the junction options has been considered using typical criteria from IAN 135/10.

7.2.4 The following work has been undertaken:

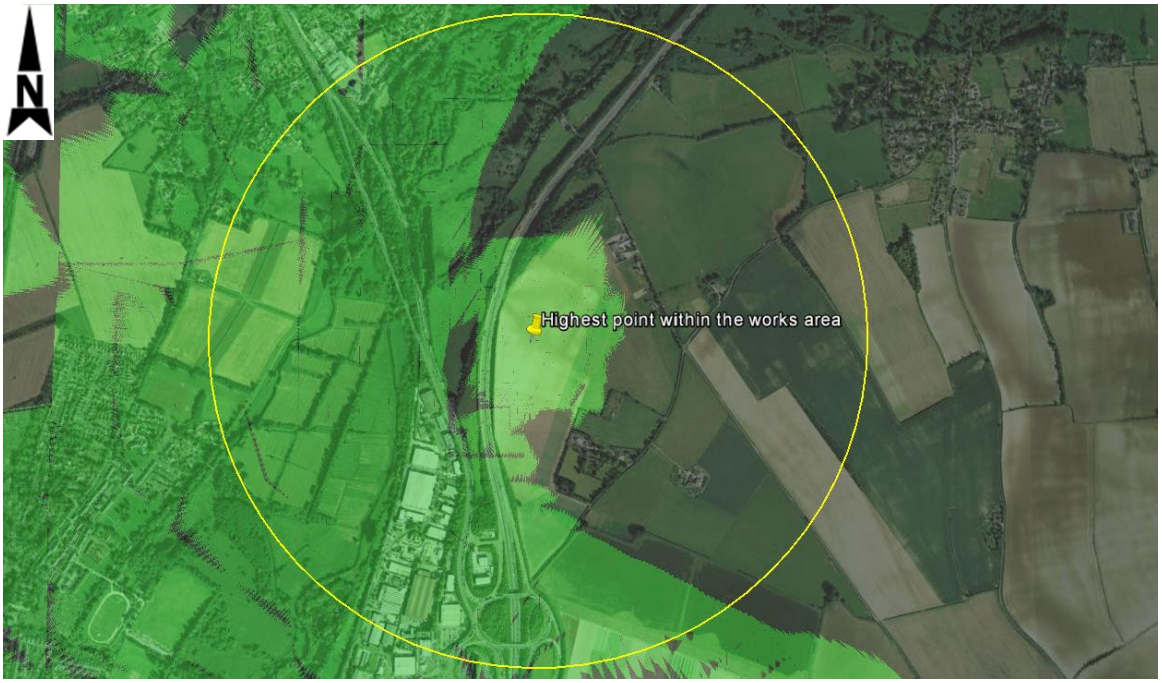
- A desk based review of relevant planning documents to identify key local policies
- A site visit (5th May 2016) to review and verify baseline findings and carry out viewpoint photography
- Assessment of the townscape, landscape and visual impact of the proposals, particularly in terms of changes to vistas, skyline views and landscape character and quality
- Broad options for mitigation and enhancement have been identified where appropriate

7.2.5 Viewpoint photography carried out during the site visit is provided in Figures 7.3 to 7.11 and the locations are illustrated on Figure 7.1

7.2.6 The zone of visual influence (ZVI) was established initially via a theoretical or “bare ground” visibility model created with the Google earth viewshed tool based on an object 12m high located on Easton Down. Twelve metres represents the maximum height of any feature within the scheme and Easton Down is the highest part of the scheme area in terms of its elevation above ordnance datum (AOD). The results of this analysis are shown in the illustration below (Figure 7.12), the green wash indicates areas of potential visibility. The yellow circle is the 1km study area surrounding Easton Down.

[18] Highways Agency, (2010), Interim Advice Note 135/10 Landscape and Visual Effects Assessment.URL: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian135.pdf [accessed on 14/03/16]
[19] The Landscape Institute and Institute of Environmental Management and Assessment, (2013), Guidelines for Landscape and Visual Impact Assessment (3rd Edition).

Figure 7-12: Theoretical visibility of an object 12 m high on Easton Down. Map Data: Google, Infoterra Ltd & Bluesky



7.2.7 Figure 7.12 indicates that the scheme will be principally visible in views from the north-west, west and south-west, based on topographical levels only, and would extend further than the 1km study area. Actual visibility would need to take into account the screening effects of built form and vegetation.

7.2.8 Actual visibility was established initially during the desk study using Google StreetView and through review of other available online photographic resources such as the Panoramic Photos from the Viewshed Study Report of the SDNP[20].The initial viewpoint selection was made with the purpose of being to provide representative viewpoints of the scheme from the surrounding landscape and from key visual receptors.

7.2.9 The ZVI was then refined further based on actual observations from the site survey. The ZVI is influenced by the amount of vegetation cover which changes throughout the year. The site visit was carried out in late spring / early summer so the surveyor was able to see through some of the deciduous vegetation to give an indication of the types of view available in both summer and winter. It is not possible to make an exhaustive visibility survey on site and the ZVI is therefore a reasonable estimate based on a number of observations. The ZVI illustrated in Figure 7.12 represents the maximum zone fo visual influence and is based on Option 11, the “most visible” scenario. The visibility envelope for the other options would be subsets of this ZVI. The viewpoint selection was further refined and finalised once the site survey has been completed.

[20] Land Use Consultants, (2015), Viewshed Study Report of the South Downs National Park. URL: http://www.southdowns.gov.uk/viewshed/panoramas/ [accessed on 10/05/16]

ASSESSMENT VIEWPOINTS

7.2.10 The photographs taken on site from each of the viewpoint locations are then aligned and compared with corresponding 3D models in GoogleEarth to allow a reasonably accurate prediction of the nature of the changes to each existing view (for each option).

7.2.11 The assessment viewpoints in Table 7-1 were selected to represent:

- The different types of receptor groups (transient, residential, etc.)
- The different types of views available from the surrounding landscape (e.g. panoramic, channelled, elevated, partial, full)
- A range in terms of distance from the scheme area
- A geographic spread from different points of the compass

Table 7-1: Assessment viewpoints

VIEWPOINT NAME AND NUMBER	DISTANCE *	REASON FOR SELECTION	FIGURE NUMBER
1. Easton Lane / Sustrans 23	100m	Residents at White Hill Cottage and Winnal Cottage Farm. Also represents recreational users of the Sustrans route within the SDNP.	Figure 7.3
2. Church Green	200m	Residential receptors in the Kings Worthy Conservation Area to the north.	Figure 7.4
3. Itchen Valley St Swithun's Way	400m	Recreational users – national trail on the valley floor. Representative viewpoint in SDNP viewshed analysis. Also represents views from Site of St Gertrude's Chapel SM.	Figure 7.5
4. Abbots Barton	800m	Residential receptors within new housing development on the far side of the Itchen Valley to the west	Figure 7.6
5. Turnpike Down	900m	Residential receptors on the north-facing hillside to the south-west	Figure 7.7
6. B3404/M3 roadbridge	1km	Road users in an elevated area to the south.	Figure 7.8
7. PRoW adjacent to railway near Well House Lane	1km	Recreational receptors on elevated ground on the far side of the Itchen Valley to the west – local use	Figure 7.9
8. B3404 nr Magdalen Hill Cemetery	1.3km	Road users on an elevated area of ground to the south-east, within the SDNP.	Figure 7.10
9. St Catherine's Hill	4km	Recreational. Representative viewpoint in the SDNP viewshed analysis.	Figure 7.11
* It should be noted that the distances referred to above and later in this chapter, where relevant, are measured from the maximum extent of the scheme which encompasses all the options			

SENSITIVITY, MAGNITUDE AND SIGNIFICANCE

SENSITIVITY

7.2.12 Desk study and site analysis of the physical landscape (e.g. landform, vegetation) and spatial components (e.g. scale, key views) was undertaken to identify key landscape characteristics and features, key visual receptors and assessment viewpoints, as well as broad site constraints and opportunities to be considered in the selection of options.

7.2.13 Baseline information was collated through a combination of field survey and desk study, which included:

- GoogleEarth Pro
- Google StreetView
- OS mapping

7.2.14 As preliminary assessment indicated that visibility of the scheme area did not extend into urban areas, townscape character was scoped out of the assessment.

7.2.15 Landscape sensitivity is judged according to the landscape quality, condition and value and the ability or ease with which the landscape can accommodate the type of change proposed.

7.2.16 Groups of similar visual amenity receptors were identified and the extent and nature of their views broadly described. Similar to landscape character, the sensitivity of the visual amenity receptors and their views has been ascertained. Sensitivity of visual amenity receptors and their views is dependent on the location and context of the view; and the expectation, occupation or activity of the visual receptor. It is also dependent on the importance of the view, which may be determined by the popularity, number of people affected, and whether it is a tourist attraction or has literary or artistic references.

7.2.17 The sensitivity of landscape and visual receptors is derived from IAN135/10, Annex 1 Table 2 and Annex 2 Table 2.

MAGNITUDE

7.2.18 Potential impacts on the landscape resource and visual amenity have been identified along with predicted magnitude. In considering the magnitude of impact on views and the surrounding landscape, proposals have been assessed in terms of their scale, spatial extent and massing. The magnitude of impact, which could be either adverse or beneficial, has been assessed using indicative criteria taken from IAN 135/10 Annex 1, Table 1 and Annex 2, Table 1.

LEVEL OF EFFECT

7.2.19 The evaluation and level of the landscape and visual effects of the scheme is derived by assessing the sensitivity of the landscape and visual receptors against the magnitude of impact (allowing for mitigation). The terminology used for the overall assessment of landscape effects is based on IAN 135/10 Annex 1.

SIGNIFICANCE

7.2.20 The assessment of significant effects will be undertaken using guidance in 'Interim Advice Note (IAN) 135/10 Landscape and Visual Effects Assessment', Highways Agency, 2010[21]; and Guidelines for Landscape and Visual Impact Assessment (3rd Edition)' (GLVIA 3), LI & IEMA, 2013[22].

7.2.21 Preliminary assessment of the options indicated that the maximum threshold for potential significant effects would be 500 m for landscape effects and 1 km for visual effects. The study area for landscape receptors has therefore been defined as 500 m from the scheme area. The study area for visual effects is 1 km although the viewpoint assessment also includes a representative view from higher ground within the SDNP to the east (Viewpoint 8) and from St Catherine's Hill some 4 km to the south (Viewpoint 9), the latter being a Highways England request.

7.3 BASELINE CONDITIONS

7.3.1 The existing highways estate in the study area, which includes the M3 corridor, the A34/Winchester Bypass and the A272/Spitfire Link, has resulted in severance between Winchester (including the River Itchen) to the north and west and the open downland (Winnal Down and Easton Down) to the east.

7.3.2 This highways estate has significantly altered the local landscape creating a fragmented and complicated landscape pattern which is dominated by the roads and associated infrastructure including bridges, cuttings, slips and signage. Figure 7.13 was taken from the B3404 single span concrete bridge over the M3, and shows the highways corridor. The width of the corridor is approximately 120 m at its narrowest point at the southern extent of the scheme area, increasing to 400 m around the Junction 9 roundabout and 500 m wide at its widest point in the northern extent of the scheme area which encompasses Easton Down and the Itchen floodplain.

[21] Highways Agency, (2010), Interim Advice Note 135/10 Landscape and Visual Effects Assessment.URL: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian135.pdf [accessed on 14/03/16]
[22] The Landscape Institute and Institute of Environmental Management and Assessment, (2013), Guidelines for Landscape and Visual Impact Assessment (3rd Edition).

Figure 7-13: Viewing north from the B3404 roadbridge

7.3.3 The landscape receptors have been described in Table 7-2.

Table 7-2: Baseline description of landscape elements

LANDSCAPE ELEMENT	BASELINE DESCRIPTION
TOPOGRAPHY	The Junction 9 roundabout and highways infrastructure to the south including slip roads and the A272/Spitfire Link are lower than the surrounding land. There is a 10m, almost vertical cut under the B3404 at the southern end of the scheme area, which is the most notable engineered landform. The highways infrastructure of the A34/Winchester Bypass is slightly elevated in order to cross the River Itchen floodplain in the north-western extents of the scheme area. To the north of J9 the M3 rises gradually at an even gradient to pass over Easton Down, this is achieved by embankments through a small combe/hollow near the Highways England depot and then cuttings on the higher ground. There are numerous ditches, water bodies, streams and rivers in the area. The largest watercourse is the River Itchen and its tributaries, which run through the northern section of the scheme area across a wide, flat floodplain
LAND USE OF THE SITE AND SURROUNDING AREA	Much of the scheme area is occupied by the highway corridors of the M3, including embankments, cuttings, bridges, slip roads, and accompanying infrastructure such as signage, fencing, embankment planting, traffic lights and occasional lighting. The south-western section of the scheme area also contains built elements, including two-storey office and construction blocks and areas of car parking around the Highways England depots. The central and northern sections of the scheme area contain areas of open farmland contrasting with a more intimate rural landscape of scattered tree and wetland where the scheme area crosses the River Itchen floodplain. The landscape to the east, south-east and north-west of the scheme area is largely one of open farmland containing large rectangular fields intersected by access tracks and bounded by hedgerows. The undulating topography and open fields allow clear long distance views across the landscape, broken up by regular clumps of mature trees, copses, hedgerow trees and hedgerows alongside lanes, tracks and field boundaries. To the south-west and west of the scheme area is the built form of Winchester, with retail parks adjacent to the M3 corridor. This area retains a small-scale and intimate

LANDSCAPE ELEMENT	BASELINE DESCRIPTION
	landscape through which the River Itchen passes. To the north of the scheme area is the village of Kings Worthy, which is separated from the built form of Winchester by woodland and the A33. The landscape to the north-east is dominated by the M3.
VEGETATION	Trees, hedgerows and wooded areas associated with highway planting are located on embankments and roundabouts of the existing M3 corridor, as well as in the adjoining landscape along with sections of semi-improved grassland and scrub. The surrounding landscape contains numerous copses and blocks of trees, allowing infrastructure and built form to be surprisingly well screened in the landscape. Viewpoint 9 (Figure 7.11) demonstrates this screening effect. The scheme area contains fields of both arable and pastural farmland, typically bounded by hedgerows, along with a more enclosed landscape to the north of lowland fen wetland and scattered trees around the River Itchen. Woodland within the scheme area with the potential to be affected by the works is shown on Figure 7.1. The arboricultural assessment (Appendix 7.1) provides a brief description and evaluation of the existing arboricultural resource within the vicinity of the proposed scheme options. Statutory designations relating to trees include two separate Tree Preservation Orders (TPOs) and the Kingsworthy Conservation Area which is located at the northern end of the study area. Tree quality of potentially affected trees is shown on Figure 7.14 Tree Constraints Plan. Over 95% of the trees are of low arboricultural quality with the remainder being medium quality trees.
HERITAGE DESIGNATIONS	Heritage designations are shown on Figure 7.1. There are no registered parks and gardens located within 500m of the scheme area, the nearest being Magdalen cemetery which is outside the ZVI and some 1.4km distant. There are three Conservation Areas within the landscape study area, although all of these are outside the ZVI and therefore do not have intervisibility with the site. This was confirmed during the site visit and is demonstrated for Kings Worthy conservation area in Viewpoint 2 (Figure 7.4). Heritage assets are assessed in Chapter 6.
LANDSCAPE DESIGNATIONS	Landscape designations are shown on Figure 7.1. The SDNP covers around 50% of the scheme area, principally around its northern and eastern sections. It incorporates the more intimate local landscape of the River Itchen to the north-west and north-east of the scheme area and also covers the downland to the east. Consideration has been given to both the direct and indirect effects upon this designated landscape and in particular the effect upon its special qualities and representative views. Special Qualities of the SDNP are set out by the South Downs National Park Authority (SDNPA) ; those special qualities that have the potential to be affected by the scheme are as follows: • Diverse, inspirational landscapes and breathtaking views • Tranquil and unspoilt places Representative views from the SDNP are included as Viewpoints 1 (Figure 7.3), 3 (Figure 7.5) and Viewpoint 8 (Figure 7.10).
PUBLIC RIGHTS OF WAY	PRoW are shown on Figure 7.1. The only long distance footpath located within the ZVI is the St Swithun's Way long distance path - A 34 mile long-distance walk from Winchester to Farnham following sections of the original route of the Pilgrim's Way – represented by Viewpoint 3. The Itchen Way and South Downs Way are outside the ZVI. Sustrans Regional Route 23 is located within the ZVI, an 80-mile route with a mixture of off and on road cycling from Reading to Southampton via Basingstoke, Alresford, Winchester and Eastleigh. The route crosses the scheme area at the M3 Junction 9 roundabout in a north-east to south-west direction along Easton Lane underpass - represented by Viewpoint 1. A number of footpaths, cyclepaths and bridleways cross the scheme area or are located adjacent to it, with many others connecting these to the wider countryside. The footpaths, cyclepaths and bridleways enable good connectivity between the urban and rural areas, with bridges and underpasses allowing access across the

LANDSCAPE ELEMENT	BASELINE DESCRIPTION
	M3 and A31, although railways and highways typically sever many connections east-west. Where paths are located on elevated ground or across open fields, their users may have clear views of sections of the scheme area – e.g. Viewpoint 7.
LANDSCAPE CHARACTER	Landscape Character Areas are illustrated on Figure 7.1. As part of the scheme area is located within the SDNP, the South Downs Integrated Landscape Assessment (SDILA) is considered. Within the SDILA, the scheme area falls into the following two character areas: • Character Area A: Open Downs and sub-area A5: East Winchester Open Downs, whose key sensitivities with the potential to be affected by the scheme are remoteness, tranquillity, and open, undeveloped skylines • Character Area E: Open Downs and sub-area E4: Itchen Valley, whose key relevant sensitivities are panoramic viewpoints from St Catherine's Hill (outside the ZVI) SDILA states: "ensure that any future traffic regulation and road upgrades associated with the M3, A34 and A31 are integrated into the rural valley landscape and ensure any signage is sensitively detailed." Hampshire County Council has produced an Integrated Landscape Character Assessment , within which the scheme area falls partly within Character Area 3c: Itchen Valley. The only key characteristics of Character Area 3c with the potential to be affected by the scheme is that it provides a setting to Winchester.

EXTENT OF VISIBILITY AND VISUAL RECEPTORS

7.3.4 The approximate extent of visibility (ZVI) is illustrated on Figure 7.12. There are two main areas of land that would be affected:

- → the east-facing slopes of the Itchen valley and parts of the valley floor to the west between Abbotts Barton and Headbourne Worthy / School Lane – in terms of specific receptors this includes a short section of the B3047 Worthy Road, the fringes of a residential development (Viewpoint 4), St Swithun's Way (Viewpoint 3); and the PRoW on elevated ground alongside the railway (Viewpoint 7)
- → the elevated downland to the south and east, specifically west and north facing slopes of Easton Down, Winnal Down and Magdalen Down – this includes a short section of the Sustrans 23 route (Viewpoint 1); residential receptors along Easton Lane (Viewpoint 1); parts of the B3404 (Viewpoints 6 and 8) and St Swithun's School and Leigh House Hospital (Viewpoints 6 and 8)

7.3.5 The ZVI also shows a relatively small area of visibility to the north of the scheme area where a minor road crosses the M3. However, only Option 11 would affect views from this location due to woodland removal.

7.3.6 The overall visibility of the scheme area is well contained as a result of built form, cuttings and the screening provided by the vegetated landscape surrounding the highways estate. It is predicted that approximately 20% of the 1km visual study area would be affected by visibility of Option 11, reducing to roughly 15% for Options 14 and 16A, less than 10% for Option 16B and less than 5% for Option 18.

7.3.7 It should be noted that the ZVI shows the "most visible scenario" which includes views of tree removal during the construction period. Visibility of the scheme area would gradually reduce post construction as mitigation planting becomes established.

KEY VISUAL RECEPTOR GROUPS

7.3.8 The following provides a summary of the key visual receptor groups within the study area, but cross referenced with the viewpoint assessment and the ZVI for clarity.

RESIDENTIAL RECEPTORS:

- → Residential properties along Longfield Road and Turnpike Down in Winnal (represented by Viewpoint 5)
- → Residential properties along or off Church Green Close and St Marys Close (represented by Viewpoint 2)
- → Residential properties along or off Long Walk and Easton Lane (represented by Viewpoint 1)
- → Mansard House; Winnall Cottage Farm, White Hill Cottage, Shoulder of Mutton Farm and Winnall Down Farm (represented by Viewpoint 1)

NON-MOTORISED USERS OF THE SURROUNDING PATH NETWORK AND OPEN SPACES:

- → Users of Bridleway 502 and Sustrans Route 23 (represented by Viewpoint 1)
- → Users of St Swithun's Way long distance footpath (represented by Viewpoint 3)
- → Users of Itchen Way long distance footpath (largely outside the ZVI but passes through the scheme area and would be directly affected by Option 11)
- → Users of PRoW to the west (represented by Viewpoint 7)

WORKERS AND VISITORS:

- → Workers and visitors to the South Downs National Park (approximately 1.5 square km (km^2) of the SDNP is within the ZVI)
- → Workers and visitors to St Swithun's Junior Prep School and St Swithun's School (represented by Viewpoints 6 and 8)
- → Workers and visitors to Leigh House Hospital (represented by Viewpoints 6 and 8)

7.3.9 The following potential receptors were identified in the scoping report, but the site visit confirmed they are not in the ZVI so they have not been considered further:

- → Residential properties along Pudding Lane and Taylor's Corner
- → Dairy Farm, Dairy Farm Cottages and Easton Manor Farm
- → Users of South Downs Way National Trail
- → Users of PRoW around Magdalen Hill Down
- → Workers and visitors to Magdalen Hill Down (butterfly conservation site, cemetery and topographical high point)
- → Visitors to the Winnall Moors Nature Reserve

→ Workers and visitors to Wykenham Trade Park and Sun Valley Business Park

VALUE OF KNOWN ENVIRONMENTAL RESOURCES AND RECEPTORS

7.3.10 The Landscape receptors identified from the baseline study which are within the ZVI have been assessed for their sensitivity and value in Table 7-3.

Table 7-3: Sensitivity value of landscape receptors

RECEPTOR	SENSITIVITY VALUE
South Downs National Park	High
Landscape Character Area A5: East Winchester Open Downs	High
Landscape Character Area E4: Itchen Valley (within SDNP)	High
Landscape Character Area 3c: Itchen Valley (outwith SDNP)	Medium

7.3.11 The visual receptors have been assessed for their sensitivity and value in Table 7-4.

Table 7-4: Sensitivity value of visual receptors

RECEPTOR	SENSITIVITY VALUE
Residential Properties	High
Recreational Receptors within the SDNP	Medium - High
Recreational Receptors outwith the SDNP	Medium
Workers	Low

7.4 REGULATORY AND POLICY FRAMEWORK

7.4.1 The NN NPS provides landscape guidance for development within nationally designated areas and requires great weight to be given to conserving landscape and scenic beauty, noting a strong presumption against any significant road widening within such areas. Impacts on nationally designated areas must be considered, even when the scheme falls outside of their boundaries. “The aim should be to avoid compromising the purposes of designation and such projects should be designed sensitively given the various siting, operational and other relevant constraints". If undertaking works in relation to, or so as to affect land in a National Park or AONB, it would need to comply with the respective duties in Section 11A of the National Parks and Access to Countryside Act 1949 and Section 85 of the Countryside and Rights of Way (CRoW) Act 2000.

7.4.2 Tree Preservation Order (TPO) legislation is covered in Appendix 7.1 – Arboricultural Assessment.

7.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

CONSTRUCTION

7.5.1 The effects during the construction stage would generally be more adverse than during operation due to the extended works area involved and the use of machinery including cranes. However, these effects would be temporary. Construction effects arising from tree removal are generally unavoidable in landscape terms. However, in visual terms advance planting can be an effective as mitigation to screen views of construction activities from particular receptors. Recommendations for advance planting to mitigate Options 11, 14 and 16A are set out in Section 7.5.11 below. All existing tree planting within the Highways England estate would be retained, wherever possible, particularly in the Itchen Valley and on Easton Down where retained trees will screen views of construction activities from receptors to the west (e.g. Viewpoints 3, 4 and 7).

7.5.2 In order to retain as many trees as possible every option would require mature trees to be left adjacent to the highways boundary and this will represent a constraint during construction. The design of the scheme will conform to best-practice guidance including BS 5837: 2012 - Trees in relation to design, demolition and construction[23] and trees will be protected in accordance with BS5837:2012.

7.5.3 The mitigation of effects on the landscape and visual resource during construction are those integral to the construction process under the 'Considerate Contractors' scheme. This is now routinely followed and includes measures such as: tidy site management to reduce visual clutter associated with the works; and construction lighting in accordance with best practice to minimise lighting intrusion to surrounding sensitive receptors.

7.5.4 Temporary works to facilitate construction (e.g. site compounds, access roads, borrow pits, traffic management and storage areas) should be located away from the elevated parts of the scheme area, particularly Easton Down where there is a risk of the works skylining (defined against the sky) when viewed from the Itchen Valley. Temporary works must also be located away from White Hill Cottage and Winnal Cottage Farm along Easton Lane as these properties are located on a hillside and have the potential for direct, close range views of the works.

OPERATION

7.5.5 During the operational phase, landscape mitigation and enhancement measures will follow the guidance in the Highways Agency DMRB, Volume 10: Environmental Design and Management, Section 0: Environmental Objectives and Section 1: Good Roads Guide. The first principle of the landscape design would be to retain and protect as much of the existing roadside vegetation within Highways England's estate as possible, especially where this vegetation provides a screening function. The second principle would be to carry out new planting for landscape and visual mitigation and to replace any vegetation lost to construction.

7.5.6 The areas of land that become or remain landlocked as a result of the works are easily large enough to accommodate 'like for like' woodland planting and the impact assessment assumes that by year 15 of operation in summer there would be a similar quantum of woodland to that lost during construction. New and upgraded road embankments and cuttings offer additional opportunities for tree planting although consideration must be given to gradients as planting and seeding on steeper slopes (greater than 1>2) is generally more costly to implement and maintain.

7.5.7 The design of new planting to the north of Junction 9 should reflect the character of the local landscape; for example, reinforcement of the riparian character of the Itchen Valley could be achieved through the use of willow, poplar and alder species. Consideration should also be given to reinforcing the visually open character of the chalk downland by creating breaks in the roadside planting or leaving the chalk unplanted and exposed on the steepest embankments or cuttings. Planting that blends with the existing valley woodlands and hedgerows (including wet woodland where relevant) will increase the perception of tranquillity. Offsite planting in the Itchen Valley should also be considered as this would increase the perception of tranquillity along St Swithun's Way long distance footpath.

7.5.8 Leftover or landlocked areas given over to woodland planting should replicate the existing highways pattern. Valley side and valley bottom woodlands should be managed to ensure a diverse species and age structure by thinning, coppicing, and replanting as necessary.

[23] BSI, (2010), 5837: 2012 - Trees in Relation to Design, Demolition and Construction, URL: http://www.crawley.gov.uk/pub_livx/groups/operational/documents/plappcomment/ehfp2040459_attachment_1.pdf [accessed on 22/06/16]

7.5.9 In terms of enhancement measures, the existing thin belt of roadside planting to the west of the A34 in the Itchen Valley could be strengthened, particularly at the northern end of the Wykeham Industrial Estate. This would help to prevent views in to the highways estate being opened up when viewing from St Swithun's Way (Viewpoint 3).

7.5.10 Long term monitoring of mature trees within the Highways England boundary would be advisable following construction. Thinning of newly planted woodlands may be required, particularly if densely planted smaller nursery stock is used. It is suggested that a fifteen year woodland management plan is drawn up. Any planting (particularly that proposed within the SDNP) would need to be agreed during the consultation process; key stakeholders include the SDNPA, residents of White Hill Cottage and Winnal Cottage Farm. The planting strategy will also need to be agreed in conjunction with ecologists who will advise on the ecological requirements (e.g. chalk grassland habitat creation may be more appropriate for parts of Easton Down and the ecological value of the Itchen Valley must not be compromised).

SUMMARY OF MITIGATION REQUIRED FOR EACH OPTION

7.5.11 A summary of the required mitigation for each option is provided below:

OPTION 11

- Screening planting and acoustic barriers are required to mitigate visual effects from White Hill Cottage and, to a lesser extent, Winnal Cottage Farm. Advance tree and shrub planting is required to mitigate adverse effects on these residential properties during the construction phase. Any advance planting within approximately 40m of the curtilage of these properties must be lower growing species only (e.g. holly, dogwood, hawthorn, viburnum, hazel, blackthorn) otherwise parts of the curtilage may be at risk of a loss of light
- Replacement planting required to reduce adverse effects on landcover, tranquillity, pattern and cultural features: notably the Itchen Valley from St Swithun's Way representative viewpoint in the Viewshed Study Report of the SDNP
- Signage should be sensitively detailed to minimise effects on views from the Itchen Valley

OPTION 14 AND 16A

- Advance planting likely to be necessary to mitigate adverse visual effects on residential properties during construction
- Replacement planting required to reduce adverse effects on landcover, tranquillity, pattern and cultural features: notably the Itchen Valley from St Swithun's Way representative viewpoint in the Viewshed Study Report of the SDNP
- Signage should be sensitively detailed to minimise effects on views from the Itchen Valley

OPTION 16B

- Replacement planting required to reduce adverse effects on landcover, tranquillity, and pattern
- Signage should be sensitively detailed to minimise effects on views from the Itchen Valley

OPTION 18

- Replacement planting required to reduce adverse effects on landcover and pattern

7.6 OVERALL ASSESSMENT

7.6.1 Effects on the removal of trees are reported in Appendix 7.1 – Arboricultural Assessment. No significant effects are predicted for any of the options provided that an equal or greater area of new trees is planted as mitigation.

EFFECTS ON THE SOUTH DOWNS NATIONAL PARK

7.6.2 This nationally designated landscape is characterised by a diverse range of landscapes including chalk valleys and open download which have the potential to be affected by the scheme options. However the presence of the existing motorway (5km of which passes through the SDNP) suggests that the scheme options would not be entirely incongruous within the local landscape. Furthermore the scheme area is on the periphery of the SDNP and doesn't represent a core part of the SDNP where levels of tranquillity would typically be higher. For these reasons overall sensitivity is high.

7.6.3 The magnitude of direct landscape effects would be influenced by the overall size or footprint of the scheme as well as the amount of disruption to the existing landscape pattern (e.g. vegetation removal). Table 7-5 summarises the direct landscape effects for each option. The magnitude of indirect landscape effects would depend on the extent of visibility of the various options.

7.6.4 Given the very large size of the designated area and the relatively small extent of direct and indirect effects, the overall magnitude of change on the SDNP as a whole would be low to negligible for Options 11, 14 and 16A, reducing to negligible for Option 16B and no change for Option 18. These conclusions assume that the required mitigation set out in Section 7.4 above would be embedded into the eventual design.

7.6.5 Key stakeholders including the SDNPA would be consulted as part of the preferred option design process (i.e. at the beginning of PCF Stage 2). It is recommended that landscape architect representatives from Highways England and the SDNPA are included on the design panel sub group to develop landscape character assessment criteria, mitigation strategies and design to reduce the potential effects.

7.6.6 The level of effect would be slight adverse for Options 11, 14 and 16A reducing to neutral for Options 16B and18 and, whilst localised significant effects may occur within some parts of the designated area, there would be no significant effects on the SDNP as a whole.

EFFECTS ON LOCAL LANDSCAPE CHARACTER

7.6.7 Landscape Character Area A5: The East Winchester Open Downs and Landscape Character Area E4: Itchen Valley are both located within the SDNP and contain large and medium scale landscapes respectively. Given that these character areas are a subset of the SDNP a similar rationale applies to the judgements on magnitude and sensitivity set out above, albeit with a slightly higher magnitude of change due to the relative size of the character areas proportionate with the SDNP as whole. The level of effect would be slight adverse for Options 11, 14 and 16A reducing to neutral for Options 16B and 18 and there would be no significant effects on the SDNP component landscape character areas as a whole. It is recommended that smaller sub-types of landscape character are identified using a finer grain of landscape character assessment at PCF Stage 2. The approach to character mapping will be agreed with consultees including the SDNPA.

7.6.8 Hampshire County Council Integrated Landscape Character Assessment Character Area 3c: Itchen Valley has relevant key characteristics in that it provides a setting to Winchester. The sensitivity of this character area is medium. The magnitude of change is considered to be low to negligible given the land take and vegetation removal proposed for each of the options and the very low likelihood of any resultant significant effects on the setting of Winchester. The level of effect would be slight adverse for Option 11 reducing to neutral for Option 18 and there would be no significant effects on this landscape character area as a whole.

7.6.9 Table 7-5 summarises the effects of each option on the three landscape character areas identified above.

Table 7-5: Landscape assessment conclusions

LANDSCAPE RECEPTOR	SENSITIVITY	CONCLUSIONS
South Downs National Park	High	→ Option 11, 14 and 16A - slight adverse, not significant → Option 16B and 18 – neutral, not significant There would be no significant effects on the SDNP as a whole as a result of the M3 J9 PCF Stage 1 options when considered in isolation from other road schemes.
Landscape Character Area A5: East Winchester Open Downs	Medium to High	→ Option 11, 14 and 16A - slight adverse, not significant → Option 16B and 18 – neutral, not significant There would be no significant effects on this landscape character area as a whole.
Landscape Character Area E4: Itchen Valley (within SDNP)	Medium to High	→ Option 11, 14 and 16A - slight adverse, not significant → Option 16B and 18 – neutral, not significant There would be no significant effects on this landscape character area as a whole.
Landscape Character Area 3c: Itchen Valley (outwith SDNP)	Medium	→ Option 11, 14 and 16A - slight adverse, not significant → Option 16B and 18 – neutral, not significant There would be no significant effects on this landscape character area as a whole.

VISUAL RECEPTORS

7.6.10 In line with the requirements for simple assessment, a summary of the predicted visual effects for each option at each assessment viewpoint is set out in Table 7-6:

Table 7-6: Viewpoint assessment conclusions

VIEWPOINT NAME AND NUMBER	CONCLUSIONS
1. Easton Lane / Sustrans 23	→ Option 11 – very large adverse, significant → Option 14 – large adverse, significant → Option 16A – large adverse, significant → Option 16B – slight adverse, not significant → Option18 - slight adverse, not significant
2. Church Green	→ All Options – neutral, not significant
3. Itchen Valley St Swithun's Way	→ Option 11 - moderate, significant → Option 14 - slight adverse, not significant → Option 16A - slight adverse, not significant → Option 16B – slight adverse, not significant → Option 18 – neutral, not significant

VIEWPOINT NAME AND NUMBER	CONCLUSIONS
4. Abbots Barton	→ Option 11 - slight adverse, not significant → Option 14 - slight adverse, not significant → Option 16A - slight adverse, not significant → Option 16B – slight adverse, not significant → Option 18 – neutral, not significant
5. Turnpike Down	→ All Options - slight adverse, not significant
6. B3404/M3 roadbridge	→ All Options - slight adverse, not significant
7. PRoW adjacent to railway nr. Well House Lane	→ Option 11 - slight adverse, not significant → Option 14 - slight adverse, not significant → Option 16A - slight adverse, not significant → Option 16B – slight adverse, not significant → Option 18 – neutral, not significant
8. B3404 nr Magdalen Hill Cemetery	→ Option 11 - slight adverse, not significant → Option 14 - slight adverse, not significant → Option 16A - slight adverse, not significant → Option 16B – neutral, not significant → Option 18 – neutral, not significant
9. St Catherine's Hill	→ All Options – neutral, not significant

7.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

7.7.1 This landscape assessment is a high level consideration of the PCF Stage 1 scheme options to support the option identification. Additional landscape and visual assessment will be required at PCF Stage 2 and 3.

7.8 SUMMARY

7.8.1 A summary of the direct landscape effects (land take and vegetation removal) associated with each option is set out in Table 7-7. Landscape and WebTAG appraisal of the likely landscape effects has indicated that there are unlikely to be significant landscape effects and therefore only simple landscape assessment is recommended if one of these options is identified as the preferred option, during PCF Stage 2.

Table 7-7: Options appraisal – landscape effects

OPTION	DESCRIPTION	LANDTAKE OUTWITH THE CURRENT HIGHWAYS EASTE (HECTARES (HA))	VEGETATION REMOVAL	RECOMMENDATION FOR TYPE OF LANDSCAPE ASSESSMENT IF OPTION BECOMES FINAL
11	Compliant Free Flow Design (120kph)	11	10.5ha of trees 140m of hedgerow	Simple (with potential identification and assessment of landscape character sub-types within the SDNP)
14	85kph Two Step Relaxation Under M3	11	6.4ha of trees 10m of hedgerow	Simple (with potential identification and assessment of landscape character sub-types within the SDNP)
16A	85kph Two Step Relaxation Under M3	4.3	5ha of trees	Simple (with potential identification and assessment of landscape character sub-types within the SDNP)
16B	85kph Two Step Relaxation Over M3	4.3	5ha of trees	Simple
18	Throughabout	N/A	1.8ha of trees	Simple

7.8.2 Visual and WebTAG appraisal of the likely visual effects has indicated that significant visual effects would be limited to Options 11, 14 and 16A and the following receptors:

- White Hill Cottage residential property
- Winnal Cottage Farm residential property
- Short sections of the Sustrans 23 cycle route passing through the site
- Short sections of the St Swithun's Way long distance footpath passing through the Itchen Valley

7.8.3 In addition, Option 11 would also result in significant visual effects to short sections of the Itchen Way.

7.8.4 Recommendations arising from the visual appraisal of the design options are as follows:

Table 7-8: Options appraisal – visual effects

OPTION	RECEPTORS WITH THE POTENTIAL TO EXPERIENCE SIGNIFICANT VISUAL EFFECTS	RECOMMENDATION FOR TYPE OF VISUAL ASSESSMENT IF OPTION BECOMES FINAL
11	→ White Hill Cottage → Winnal Cottage Farm → St Swithun's Way → Itchen Way → Sustrans 23	Detailed
14	→ White Hill Cottage → Winnal Cottage Farm → St Swithun's Way → Sustrans 23	Detailed

OPTION	RECEPTORS WITH THE POTENTIAL TO EXPERIENCE SIGNIFICANT VISUAL EFFECTS	RECOMMENDATION FOR TYPE OF VISUAL ASSESSMENT IF OPTION BECOMES FINAL
16A	→ White Hill Cottage → Winnal Cottage Farm → St Swithun's Way → Sustrans 23	Detailed
16B	→ St Swithuns Way → Sustrans 23	Simple
18	→ Sustrans 23	Simple

7.8.5 Following implementation of mitigation measures outlined in section 7.5 the landscape and visual impacts are considered to be slight adverse.

7.8.6 The M3 is located adjacent to and partially within the SDNP. The extent of the direct and indirect effects on the SDNP will be relatively small and localised, in comparison to the large size of the SDNP. The overall magnitude of change on the SDNP as a whole would be low to negligible for Options 11, 14 and 16A, reducing to negligible for Option 16B and no change for Option 18, assuming appropriate mitigation.

7.8.7 The level of effect on landscape character would be slight adverse for Options 11, 14 and 16A reducing to neutral for Options 16B and 18. Significant visual effects would be limited to Options 11, 14 and 16A with more limited effects on Options 16B and 18.

7.8.8 The options which avoid Easton Down (Options 16B and 18) perform best in landscape and visual terms and are therefore ranked higher than the other options. Option 18 is ranked above Option 16B as it is slightly less visually intrusive. The lower ranking options are those which extend across Easton Down (Options 11, 14 and 16A). The ranking of options in terms of landscape and visual receptors is as follows: Option 18, Option 16B, Option 16A/Option 14 and Option 11.

7.8.9 The overall value of the arboricultural resource which is likely to be affected is considered to be low/moderate. The magnitude of impact during and immediately post-construction is likely to be medium adverse, however, this will be mitigated over time by planting, which is anticipated to have a medium beneficial effect. The overall long-term arboricultural effect of all options is therefore considered to be neutral on the basis that only predominately low quality trees will be affected and that an equal area of potentially more resilient trees will be planted, as mitigation, and will be established once construction is complete.

8 NATURE CONSERVATION

8.1 INTRODUCTION

8.1.1 This chapter provides a simple assessment of potential impacts on ecological resources as a result of the M3 Junction 9 Improvements scheme.

8.1.2 There are five Options under consideration, assessed within this ESR; as described in Section 3.2. The assessment of these Options takes into account existing baseline information including the results of a desk based review, and walkover completed in January 2016. The desk study results are appended to this ESR, see Appendix 8.1.

8.1.3 The ESR should be read in conjunction with the Assessment of Implications on European Sites (AIES) (HE551511-WSP-EGE-M3J9-PCF1-RE-PM-AIES03), and Environmental Appraisal of the SDNP and River Itchen (hereafter referred to the 'SDNP and River Itchen EA') (HE551511-WSP|PB-EGE-M3J9-RE-EN-002) also completed for the scheme, which spans the River Itchen Special Area of Conservation (SAC).

8.2 ASSESSMENT METHODOLOGY

BASELINE DATA COLLATION

8.2.1 An ecological desk study was completed during December 2015 and January 2016 to collate existing biological records, relevant to the scheme, held by third parties. The following was sought:

- Information relating to European Sites[24] and internationally designated Ramsar sites within 2km (extended to 30km for those sites designated for bats (or those downstream of a river channel within the Site)
- Information relating to other statutory and non-statutory designated sites[25], ancient woodland and habitats of principal importance (HPI)[26] within 2km
- Records of protected and notable species within 2km (extending to 5km for bats), provided by Hampshire Biological Information Centre (HBIC)

8.2.2 In addition, a walkover of the Study Area was completed to gather preliminary information regarding habitats present and their suitability to support protected and/or notable species. The walkover was completed by a Principal Ecologist and an Assistant Ecologist on 13 January 2016.

[24] For example Special Protection Areas (SPA) and Special Areas of Conservation (SAC) protected under The Conservation of Habitats and Species Regulations (the 'Habitats Regulations') 2010.
[25] For example Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Local Nature Reserves (LNR) and Sites of Importance for Nature Conservation (SINC).
[26] Habitats of Principal Importance are those listed on Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 as priorities for conserving biodiversity.

ASSESSMENT OF IMPACTS

8.2.3 This assessment is based on the current understanding of the baseline conditions and the limited Option design information that is available at this early stage in the design process.

8.2.4 The value of sites, habitats, species assemblages and populations of species have been evaluated with reference to both their importance in terms of 'biodiversity conservation' value (which relates to the need to conserve representative areas of different habitats and the genetic diversity of species populations) and their legal status. Where sufficient baseline information was available ecological features identified were evaluated within a geographic context on the following basis:

- International
- UK/National
- Regional
- Authority Area (e.g. County or District)
- Local or Parish
- Site (i.e. within the Ecological Survey Area)

8.2.5 This process was completed using professional judgement, with reference to published guidelines (IAN130). Where baseline data is not yet available, the potential presence of habitats and/or species was considered, but these features were not evaluated as insufficient information was available at this stage.

8.2.6 Potential effects on features scoped into the assessment were then considered, taking into account construction (to include site preparation) and operational phases. Effects have been assessed against baseline conditions and characterised with reference to ecological structure and function of the feature in question, for instance the fragility/stability of an ecosystem and its connectivity to other features or resources. Where it is possible to do so, the duration of the effect has been considered, including whether the effect is temporary or permanent and whether it is considered to be short-term, medium-term or long-term. In addition, the nature, direct or indirect, of the effect has been considered. Current good practice guidelines advise the duration of an effect should be defined with regard to the ecological characteristics of the receptor affected, such as the lifecycle of a species. Consequently, what is considered short term, medium term or long term can vary depending on the receptor affected. Therefore, within the ESR, the meaning of each duration term has been defined within the assessment text as appropriate.

8.2.7 The geographical scale of significance has been used both to evaluate the receptor and to assess the scale at which an effect is significant. An ecologically significant effect is defined as an effect (adverse or beneficial) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area. The significance of effects upon receptors is determined considering their value at a geographic scale (as noted above). However any given effect may be significant at a reduced scale depending on the extent and magnitude of the effect.

8.2.8 For ease of cross reference with other environmental topics, the ecological significance of effects has also been described using the terms outlined within Section 4.4.

8.3 BASELINE CONDITIONS

STATUTORY DESIGNATED SITES

8.3.1 The River Itchen SAC passes below the existing M3 J9, and lies within the scheme extent for all five scheme options (albeit below the carriageway, rather than directly affected by Options 14, 16a, 16b and 18). The River Itchen SAC is of nature conservation value at the international scale, and is of very high environmental value.

8.3.2 Further information is contained within the appended desk study, and accompanying AIES. In summary, the river is designated primarily for the presence of the following habitats and species:

- Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- Southern damselfly *Coenagrion mercurial*
- Bullhead *Cottus gobio*

8.3.3 Qualifying features also include:

- White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*
- Brook lamprey *Lampetra planeri*
- Atlantic salmon *Salmo salar*
- Otter *Lutra lutra*

8.3.4 The River Itchen is also a designated SSSI, primarily due to the complex mosaic of habitats found within the riparian zone and the species which occur within them, including otter, water vole *Arvicola terrestris,* and the white-clawed crayfish. The River Itchen SSSI is of nature conservation value at the national scale, and is of high environmental value. There are no further UK statutory designated sites within a 2km study area surrounding the scheme area.

8.3.5 A wider search for European Sites within 30km of the scheme was also completed to screen for sites designated for mobile species such as bats, which could be dependent upon habitats affected by the scheme. Mottisfont Bats SAC lies approximately 16.7km (straight line) to the west of the scheme extent. The SAC is designated for the maternity colony of barbastelle bats present. Although there is habitat near to the scheme extent which provides suitable foraging habitat for barbastelle bats, and this species is recorded throughout Hampshire, it is unlikely to be used as a core foraging area by the Mottisfont colony because this species tends to primarily forage within approximately 6km of their roost sites (based on a core sustenance zone of approximately 6km, assessed with moderate confidence[27]).

NON-STATUTORY DESIGNATED SITES

8.3.6 There are seven Sites of Importance for Nature Conservation (SINC), one Road Verge of Ecological Importance (RVEI), and one site that is both a SINC and RVEI, within a 2km study area surrounding the scheme extent (illustrated in Appendix 8.1). These sites are designated at a County scale for their nature conservation value, and are of medium environmental value. Two lie in very close proximity to the scheme extent, namely:

[27] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.). The Bat Conservation Trust, London.

- Easton Down SINC, which is designated for '*grasslands which have become impoverished through inappropriate management but which retain sufficient elements of relic unimproved grassland to enable recovery*'
- Easton Lane RVEI, described as '*Both sides of Easton Lane north east of M3 Junction 9 to Junction 8 are designated … due to the presence of the protected and notable species; hedgerow crane's bill Geranium pyrnaicum a rare chalk grassland plant.'*

8.3.7 Easton Down SINC lies within the footprint of Option 11. Easton Lane RVEI lies within the footprint of Options 11, 14, 16a.

8.3.8 All other non-statutory sites lie over 250m from the scheme area; the location of these sites and reasons for designation are described in the appended desk study. The national ancient woodland inventory does not contain any parcels of ancient woodland within a 2km study area surrounding the scheme area.

HABITATS WITHIN THE SCHEME EXTENT

8.3.9 The area surrounding Junction 9 of the M3 is urban to the west and northwest of the junction and primarily rural in all other directions.

8.3.10 Between the existing M3, and A34 lies Easton Down which supports calcareous grassland, which lies to the east of the River Itchen. The River Itchen flows north to south between the roads, before flowing below the A34 towards the centre of Winchester. The SSSI and SAC designation spans this length of the river and surrounding floodplain grassland. To the east, the land is dominated by agricultural use, with a series of large arable fields present separated by hedgerows. The desk study data indicates that Habitat of Principal Importance occurs within the Study Area, including deciduous woodland, lowland fen, lowland calcareous grassland, lowland meadow and reedbed.

8.3.11 Land take will be required for all the scheme options; with the amount of land required varying between each scheme option.

SPECIES RECORDS (DESK STUDY RESULTS)

8.3.12 Targeted species surveys will be undertaken at later stage in the scheme design, however existing records held by third parties have been collated and key points are summarised in Table 8-1. The desk study collated records within 2km of the scheme, increased to a 5km buffer area for bat records (reflecting the highly mobile nature of this species group).

Table 8-1: Summary of species records (desk study results)

SPECIES GROUP	OVERVIEW OF EXISTING SPECIES RECORDS COLLATED
Bats	There were no bat records within the scheme area. Seven bat species were identified within a 5km radius study area surrounding the scheme area; Daubenton's bat *Myotis daubentonii*; Natterer's bat *Myotis nattereri*; noctule bat *Nyctalus noctula*; brown long-eared bat *Plecotus auritus*; common pipistrelle *Pipistrellus pipistrellus*; soprano pipistrelle *Pipistrellus pygmaeus;* and Serotine *Eptesicus serotinus*. The closest bat record to the scheme area was soprano pipistrelle, located 21m to the south-east, with all the others located over 350m from the scheme area.
Riparian Mammals (Otter and Water Vole)	There were numerous (357) water vole records for the River Itchen; a small number of these were within the scheme area, however the majority were downstream, and one was upstream. There were eighteen otter records within the 2km radius study area surrounding the scheme area. These records were provided at 1km or lower resolution, so although a number of the records included part of the scheme area, it was not possible to confirm whether these lie within the scheme area.
Dormouse *Muscardinus avellanarius*	There were eight records of dormouse within the 2km radius study area surrounding the scheme area; this included one record at 1km resolution, which included part of the scheme area.
Badger *Meles meles*	A total of six records of badger were identified within the study area; some of the records at the 1km resolution span part of the scheme area, however, it was not possible to confirm whether these lie within the scheme area.

SPECIES GROUP	OVERVIEW OF EXISTING SPECIES RECORDS COLLATED
Freshwater Fish	The designation criteria for the River Itchen SAC include Atlantic salmon, bullhead, and brook lamprey, there were no records of these, nor of other non-qualifying freshwater fish species of conservation concern identified within the 2km study area surrounding the scheme area. This is more likely to be an absence of records in the HBIC as opposed to an absence of fish.
Reptiles	Records of common lizard *Zootoca vivipara* and slow worm *Anguis fragilis* were returned, however records for both of these species were recorded > 800m from the scheme area.
Amphibians	No amphibian records were returned.
Birds (Breeding and Wintering)	Records for a total of 79 bird species were returned within the 2km study area surrounding the scheme area; this included 35 species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), which are afforded additional protection in relation to disturbance whilst nesting. The total also includes 33 species included on the Red List of Birds of Conservation Concern (Birds of Conservation Concern 4, Eaton *et al*.). Of those identified on the River Itchen SSSI citation, records of pochard, shoveler, lapwing, redshank, snipe and Cetti's warbler were identified within the desk study. Species include both breeding birds, and wading birds and wetland passerines which may utilise habitat in proximity to the scheme extent to forage and/or overwinter.
Invertebrates (aquatic and terrestrial)	A total of 167 invertebrate species were returned within the 2km study area surrounding the scheme area. Although the SAC criteria include the southern damselfly and white clawed crayfish, no records of these were returned within the desk study. The 167 species include a majority Lepidoptera (butterflies and moths), with other species from the Coleoptera (beetles), Diptera (fly), Hymenoptera (bees and wasps), Hemiptera (bug) families. Three invertebrate species records lie within a 1km grid squares that overlap the scheme area, including the small heath butterfly *Coenonympha pamphilus*, the silver wash fritillary *Argynnis paphia* and the stag beetle *Lucanus cervus.* All species presented within the desk study are either protected, notable or of conservation concern.
Rare / Notable Plants	A large number of plant records were returned within the 2km study area surrounding the scheme area; these include eighteen species which were recorded within one of the same grid squares as the scheme area. Records include Species of Principal Importance such as white helleborine *Cephalanthera damasonium*, and species on National / County scare /rare lists, of those listed as Near Threatened by the International Union for Conservation of Nature (IUCN).
Other Species: SPI	A range of other species records were identified within the 2km study area surrounding the scheme area; these include SPI such as, polecat *Mustela putorius*, harvest mouse *Micromys minutus*, brown hare *Lepus europeaus* and hedgehog *Erinaceous europaeus*. Species listed under the above headings are also SPI (such as invertebrates, plants, birds and amphibians), but due to the number of records within each group have not been referred to separately.

8.4 REGULATORY AND POLICY FRAMEWORK

8.4.1 The policy and legislation identified in Appendix 2.1, is of relevance to the scheme as it requires effects of the scheme upon sensitive ecological features to be properly assessed, and mitigation measures to be formulated and implemented to avoid negative effects. Option 11 crosses the River Itchen SAC and SSSI in a new location (separate to the existing crossings). with other options including work nearby. Options 11, 14, 16A and 16B require land take from surrounding habitats; Option 18 is limited to the existing roundabout at Junction 9. Sensitive design and the implementation of mitigation will be required to ensure compliance with the above legislation.

8.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

8.5.1 This section identifies mitigation and enhancement measures that are recommended based on information currently available. At this stage of the assessment process, without information from detailed surveys or detailed design, only broad recommendations of likely mitigation requirements are possible. These are described below and are considered to be applicable to all the scheme options unless stated otherwise.

8.5.2 The measures described are those likely to be most appropriate given the identified ecological features. Further surveys will be necessary at more detailed stages of design to confirm the exact mitigation requirements necessary for individual Options and specific impacts. Key mitigation measures that are likely to be included within the Options designs are broadly grouped as follows:

- Measures that avoid the adverse impact (for example, the re-siting of construction compounds, or adjustments in road alignment etc.)
- Where the adverse impact cannot be avoided or sufficiently reduced, measures that compensate for the loss of the particular ecological resource that is affected (for example, at least like-for-like replacement of lost habitats, etc.) will be required
- Enhancement by habitat creation, improved management and long-term monitoring. Defined as *'measures over and above normal mitigation'* (IAN 125/15)

8.5.3 For the purpose of this assessment mitigation is defined as 'measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects' (DMRB Volume 11, Section 1, Part 7 (HA 218/08)). It is assumed that the mitigation measures listed below will be implemented, and as such, these have been factored into the impact assessment.

DESIGN AND MITIGATION

8.5.4 The following design and mitigation measures are taken into account for the purpose of this ESR:

- Designing the footprint for the scheme options to:
  - Minimise the extent of semi-natural habitat affected by the scheme, to avoid effects upon habitats present and consequent effects upon protected or notable species through habitat loss and fragmentation
  - Include a sensitive drainage strategy that minimises effects upon local hydrological processes fundamental to the River Itchen
  - Avoid designated habitat where possible, specifically the avoidance / reduction of works in proximity the River Itchen SSSI and SAC, and non-statutory sites including Easton Down SINC and Easton Lane RVEI
- Correct timing of works to avoid key periods for particular species, such as avoidance of the bird breeding season for habitat clearance where required
- Translocation and / or displacement and exclusion of species (under appropriate licences / agreements) where required from the Option footprint to pre-selected receptor habitat to minimise impacts of habitat loss and species mortality
- Appropriate design and use of lighting to minimise impacts on bats and other light sensitive species, during the construction phase and, if applicable, during the operational phase
- Appropriate landscaping and re-landscaping of all roadside verges and disturbed habitat specifically to benefit species known to be present in the area (where suitable for network and safety priorities). All landscaping should use species of local provenance
- The use of screening during construction where appropriate to minimise the spread of noise, dust, lighting etc. and the use of fencing to temporarily exclude species by restricting access into particular areas (such as reptile exclusion fencing) if appropriate
- Implementation of a strict pollution prevention protocol during the construction phase, to ensure that dust and particulate pollution of protected and notable habitats within the vicinity of the construction area is avoided. In practice it is likely that a CEMP will be prepared prior to any works to set-out how the risk of pollution incidents will be reduced or avoided. It is recommended that this makes reference to established good practice guidance

ENHANCEMENT

8.5.5 Beyond the above mitigation, where possible ecological enhancement measures should be designed into the scheme. Measures should be consistent with local biodiversity conservation objectives. There are opportunities to contribute towards the objectives of the Itchen Valley Biodiversity Opportunity Area (BOA) which spans the scheme area; this includes the

enhancement and creation of lowland calcareous grassland and lowland mixed deciduous woodland.

8.5.6 Consideration should be given to the future management of retained and newly created habitat, using methods that benefit species and habitats present. Enhancement measures should take into account the results of detailed surveys, and more detailed scheme designs. It is recommended that Hampshire Wildlife Trust is consulted with respect to designing ecological enhancement measures which contribute towards the Itchen Valley BOA.

MONITORING AND MANAGEMENT POST-CONSTRUCTION

8.5.7 Consideration should be given to the requirement for a post-construction monitoring programme once the preferred option has been selected, and relevant site surveys completed. The objective of monitoring and post-construction management would be to assess the establishment of the ecological mitigation measures, help inform future management and, if necessary, allow for the implementation of remedial measures.

8.6 OVERALL ASSESSMENT

INTRODUCTION

8.6.1 This section characterises the potential ecological impacts that are likely to arise during construction, taking into consideration the following parameters: beneficial / adverse effect, magnitude, extent, duration, reversibility, and timing / frequency.

8.6.2 At the generic environmental assessment level, construction impacts are generally considered to be temporary effects from site activities and operational impacts to be the permanent effects resulting from the scheme options. For this assessment, impacts that occur at the construction stage including land-take and habitat loss (either temporary or permanent) are considered under construction impacts.

8.6.3 Table 8-2 identifies the ecological features that have been scoped into or out of the ESR at the current time; it is possible to scope certain ecological features out of the assessment for scheme option 18 because this option has a smaller footprint to other scheme options. As further survey and designs progress, the scope of the ESR should be refined – notably with respect to protected species, and species of conservation concern which are excluded at the present time due to the absence of survey information; this is further discussed below. A summary of the current impact assessment is provided in Table 8-4.

Table 8-2: Preliminary scoping of potential ecological features

ECOLOGICAL FEATURE	SCOPING: IN / OUT OF THE ESR				
	OPTION 11	OPTION 14	OPTION 16A	OPTION 16B	OPTION 18
European Designated Sites	Y	Y	Y	Y	N
UK Statutory Designated Sites	Y	Y	Y	Y	N
Non-statutory Designated Sites	Y	Y	Y	Y	N
Habitat of Principal Importance (HPI), and 'Important' Hedgerows	Y	Y	Y	Y	Y

STATUTORY DESIGNATED SITES (RIVER ITCHEN SAC AND SSSI)

8.6.4 The River Itchen SSSI and SAC spans the scheme area to the north of M3 J9, crossing below the existing A34 and M3. All the scheme options require works within the drainage catchment of the River Itchen to varying extents. Option 18 requires the least works, with the construction footprint largely lying within the existing roundabout. Options 14, 16A and 16B require limited works between the existing A34 and M3, and are therefore likely to influence local hydrology which may have effects upon the SAC and SSSI. Option 11 requires substantial works within the flood plain located between the existing A34 and M3, and is therefore likely to require detailed avoidance and mitigation measures to minimise effects upon the SAC and SSSI such that they are not significant effects.

8.6.5 The design and mitigation measures, outlined within Section 8.6, will reduce the probability of significant effects upon the River Itchen SAC and SSSI, including:

- Minimising the extent of semi-natural habitat affected by the scheme, and compensating for any habitat reductions through the creation of alternative habitat, and/or habitat restoration to avoid net loss in habitat resource
- Implementation of a sensitive drainage strategy that minimises effects upon local hydrological processes fundamental to the River Itchen
- Implementation of a strict pollution prevention protocol during the construction phase

8.6.6 Assuming these measures are implemented effectively, it is anticipated that the construction of Options 14, 16A, 16B and 18 would not result in long term effects to the River SAC and SSSI. This is primarily due to the relatively small construction footprint and location of works in relation to the designated site. Options 14, 16A and 16B may result in temporary effects upon qualifying species during the construction phase (for example otter); and the principles for avoidance and mitigation measures to reduce these effects proposed in Section 8.6 will need to be refined on receipt of detailed survey information if either of these scheme options is progressed.

8.6.7 Option 11 requires substantial works within the floodplain and has potential to cause both temporary and longer term effects upon the SAC and SSSI. At this stage there is insufficient evidence to conclude with certainty that effects will not be significant. A detailed assessment of potential effects upon the SAC and SSSI will be required once detailed survey information with respect to habitat types directly affected by the scheme (Phase 1 habitat survey results), detailed hydrological assessment/modelling, and species survey information (to include otter) is available.

NON-STATUTORY DESIGNATED SITES

8.6.8 Two non-statutory sites lie within the scheme area; Easton Down SINC and Easton Lane RVEI.

8.6.9 Option 18 will not require land take from these two sites, although it could potentially affect the habitats present through changes in air quality; particularly Easton Lane RVEI if this route is used for construction transport. Pollution prevention measures outlined in Section 8.6, however, would reduce the risk of an adverse impact upon the RVEI. Providing mitigation measures are implemented, it is anticipated that Option 18 would have negligible effects upon non-statutory designed sites.

8.6.10 Options 14, 16A and 16B do not require landtake from Easton Down SINC during construction, although may result in changes to traffic flows during the operational phase, that would bring traffic closer to Easton Down SINC.

8.6.11 Option 11 requires land take from Easton Down SINC during the construction phase, and would result in changes to traffic flows during the operational phase, that would bring traffic closer to Easton Down SINC. This has potential to cause significant effects in terms of permanent habitat loss, and habitat degradation resulting from changes in air quality. These effects would be

irreversible and potentially be significant at the County scale because they would damage the integrity of the Easton Down SINC and limit future management of the retained sections. The moderate magnitude of change on this medium value feature would yield a moderate / large adverse significant effect. Compensation would be required to counter this effect, in the form of habitat translocation and/or creation to ensure no net loss in the extent of calcareous grassland and fauna dependent on this habitat type[28].

8.6.12 Options 11, 14 and 16A would also require land take from Easton Lane RVEI during the construction phase. This also has potential to cause significant effects, although at a lesser scale because the extent of habitat removal would be limited, extending along a small section of the RVEI nearest to the existing roundabout. There are likely to be limited adverse effects during the operational phase because the traffic flows on Easton Lane are not likely to change as a result of the Scheme. Habitat loss from the RVEI would be permanent and irreversible, and likely to be significant at the Local scale (given the proportion of the habitat affected and linear nature of the designated area). The minor magnitude change on this medium value feature would yield a slight adverse significant effect. Compensation would be required in the form of habitat creation to ensure no net loss in the extent of calcareous grassland and fauna dependent on this habitat type.

ON-SITE HABITATS

8.6.13 All the scheme options will require the removal of semi-natural habitat during the construction phase, to varying extents. At this stage; with the exception of the non-statutory sites described above, survey data is not yet available to evaluate the nature conservation value of habitat affected. Design and mitigation measures will form part of the scheme to minimise adverse effects upon habitats present, especially those hydraulically connected to the River Itchen and those upon which qualifying species of the SAC may be dependent.

8.6.14 Option 11 requires land take from Easton Down SINC, and Options 11, 14, 16A and 16B require landtake from adjacent grassland which may be of elevated nature conservation value. The desk study information indicates that the Option footprints also include lowland fen, which is a HPI and likely to be of elevated nature conservation value (site survey information will be required to evaluate the nature conservation value fully). Option 11 affects the largest area of semi-natural habitat, also fragmenting retained habitat to the south of the proposed new A34 southbound link to the M3. Options 14, 16A and 16B all affect a similar area of semi-natural habitat, largely located to the east of the existing A34 alignment. All four options are likely to have permanent, irreversible impacts upon semi-natural habitats that will require mitigation and/or compensation in the form of habitat creation to avoid a net loss in nature conservation value. At this preliminary stage it is anticipated that adverse effects may be significant at the District/County scale; in DMRB terms, a minor/moderate magnitude change upon a low/medium value feature would yield an effect of slight to moderate significance.

8.6.15 Option 18 occupies a smaller footprint, largely limited to the existing junction. Whilst the Option requires removal of tree cover and scrub, the habitat occurs on made ground and is unlikely to be of inherent nature conservation value at above the Site or Local scale (subject to confirmation through site survey). As noted with respect to the landscape assessment, assuming that the area within the existing roundabout and the embankments associated with the new carriageway can be replanted then there is unlikely to be any significant reduction to the area currently occupied by trees. For this reason, at this preliminary stage it is anticipated that adverse effects would be temporary, for the duration of the construction phase and a period afterwards whilst new tree

[28] Detailed botanical survey information regarding Easton Down will be required to assess the feasibility, and value of translocation compared to habitat creation to compensate for the loss of part of Easton Down SINC should Option 16A, 16B or 18 be progressed.

planting becomes established. In DMRB terms, a minor magnitude change upon a low value feature would yield an effect of neutral (or negligible) significance.

PROTECTED SPECIES

8.6.16 In the absence of detailed protected species survey data, it is not possible to fully assess the impacts resulting from each scheme option. Based on the option designs and likely footprints, it is however possible to consider potential further ecological survey requirements. Table 8-3 displays the results of a preliminary review regarding likely survey requirements and potential effects of each scheme option upon species/species groups if present within habitat within the scheme area.

8.6.17 The extent of further survey required will be dependent on the scheme options progressed; it should be noted that Option 18 has a considerably smaller construction footprint to the other scheme options and hence will require less further survey and has less potential for significant effects upon species populations if present.

Table 8-3: Potential further ecological survey requirements

ECOLOGICAL FEATURE	POTENTIAL REQUIREMENT FOR SURVEY / POTENTIAL EFFECT*				
	OPTION 11	OPTION 14	OPTION 16A	OPTION 16B	OPTION 18
Otter and water vole	Y	Y	Y	Y	N
Dormouse	Y	Y	Y	Y	Y
Bats (foraging and roosting)	Y	Y	Y	Y	Y
Birds (breeding and potentially wintering)	Y	Y	Y	Y	N
Freshwater fish (notably species which are qualifying species of the River Itchen SAC)	Y	N	N	N	N
Reptiles and amphibians	Y	Y	Y	Y	Y
Badger	Y	Y	Y	Y	Y
Botanical interest (to include hedgerow surveys)	Y	Y	Y	Y	N
Aquatic and terrestrial invertebrates	Y	Y	Y	Y	N

* Subject to consultation with relevant stakeholders, and results of extended Phase 1 habitat survey.

8.6.18 There may also be a requirement to undertake invasive species surveys, and propose measures to prevent the spread of these species if present within the scheme area.

8.6.19 Once detailed habitat and species surveys have been completed, the effects upon these ecological features should be fully assessed in relation to detailed scheme designs.

8.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

8.7.1 Given the early stage in the design process, the simple assessment has been completed at a high level only. Effects upon designated sites and habitats have been considered, however this will need to be updated once more detailed information becomes available during PCF2 and extended to include a thorough consideration of effects upon protected and/or notable species.

8.7.2 Key information that will be required for the detailed assessment of the Options includes:

- → Final (or refined) construction footprints for each of the Options, to include construction compounds, haul routes and temporary drainage arrangements

- Detailed information regarding likely changes to air quality, and changes to hydrology
- Habitat survey results (extended Phase 1 habitat survey and botanical survey)
- Species survey results (protected species surveys as appropriate)

8.7.3 It should be noted that desk study results have been used to inform the ESR, and that whilst HBIC hold a highly valuable data resource collated from multiple recording groups, records held are generally collected on a voluntary basis. For this reason, the absence of records does not demonstrate the absence of species and/or habitats; it may simply indicate a gap in recording coverage.

8.8 SUMMARY

8.8.1 A simple review of potential effects of the M3 Junction 9 Improvement scheme upon designated sites and habitats has been completed; a summary of the findings is provided in Table 8-4.

8.8.2 The scheme option least likely to result in significant effects upon ecological features is Option 18, primarily due to the limited footprint located within the existing junction. While this option may have temporary effects associated with the removal of tree and shrub vegetation, measures to replace and enhance habitat would form part of the designs and avoid any permanent, adverse impacts upon ecological features.

8.8.3 Options 11, 14, 16A and 16B all require the removal of semi-natural habitat to the north of the existing roundabout, are in closer proximity to the River Itchen SAC and SSSI. Option 11 would have effects of greatest significance, reflecting damage to the integrity of Easton Down SINC, fragmentation of retained calcareous grassland habitat and the potential for effects upon habitat hydraulically connected to the River Itchen SAC and SSSI. Options 14, 16A and 16B require a smaller footprint, however still require land take encompassing habitat of nature conservation value at the County scale.

8.8.4 At this stage there is insufficient information to inform a detailed assessment of effects of the scheme upon species populations. Consideration has been given to the likely requirement for further survey (Table 8-3), based on habitat types affected by the different Options. The extent of further survey required will be dependent on the Options progressed; it should be noted that Option 18 has a considerably smaller construction footprint to the other Options and hence will require less further survey, and has less potential for significant adverse effects upon species populations if present.

Table 8-4: Preliminary assessment of likely significant effects

FEATURE	POTENTIAL FOR SIGNIFICANT EFFECT (DMRB SIGNIFICANCE)					NOTES / RECOMMENDATIONS
	OPTION 11	OPTION 14	OPTION 16A	OPTION 16B	OPTION 18	
European Sites (River Itchen SAC)	Sufficient uncertainty remains in relation to the potential for significant effects upon the SAC resulting from the scheme.				N	Should Options 11, 14, 16A and/or 16B be progressed a detailed assessment of potential effects upon the River Itchen SSSI and SAC will be required once detailed survey information with respect to habitat types affected by the scheme (Phase 1 habitat survey results), detailed hydrological assessment/modelling, and species survey information (to include otter) becomes available.
UK Designated Sites (River Itchen SSSI)	Y (Slight - Moderate)	Y (Slight - Moderate)	Y (Slight)	Y (Slight)	N	

FEATURE	POTENTIAL FOR SIGNIFICANT EFFECT (DMRB SIGNIFICANCE)					NOTES / RECOMMENDATIONS
	OPTION 11	OPTION 14	OPTION 16A	OPTION 16B	OPTION 18	
Non-statutory Designated Sites (Easton Lane RVEI and Easton Down SINC)	Y (Moderate - Large)	Y (Moderate)	Y (Moderate)	N)	N	The significance of effects upon non-statutory sites will be dependent on land take from Easton Down SINC (Option 11) and Easton Lane RVEI (Options 11, 14 and 16A); and assessment should take into account any variation in existing habitat value within the designated area and adjacent grassland (to be determined through detailed botanical survey). From an early stage, consideration should be given to potential translocation / habitat creation options to compensate for the loss of calcareous grassland should this prove unavoidable.
On-site Habitats	Y (Slight - Moderate)	Y (Slight - Moderate)	Y (Slight - Moderate)	Y (Slight - Moderate)	N	This preliminary assessment should be refined once Phase 1 habitat survey is available and botanical survey information where applicable (for example with respect to Easton Down SINC and nearby grassland).

9 GEOLOGY AND SOILS

9.1 INTRODUCTION

9.1.1 This chapter provides a high level assessment of the potential impacts on geology, geomorphology and soils arising from the scheme area. Consideration has also been given to potential land contamination constraints. This chapter identifies the baseline conditions in the scheme area, and then considers the potential for impacts associated with the scheme options. The scheme area with respect to this chapter is considered to comprise the five scheme option alignment routes

9.1.2 The geology, geomorphology and soils assessment is closely related to other assessments including Road Drainage and the Water Environment (Chapter 13).

9.2 ASSESSMENT METHODOLOGY

9.2.1 This assessment has been undertaken in accordance with the principles of:

- Design Manual for Roads and Bridges (DMRB) Volume 4, Section 2, HD22/08, Managing Geotechnical Risks, August 2008
- DMRB Volume 11, Section 2, Part 5 Assessment and Management of Environmental Effects, August 2008
- DMRB Volume 11, Section 3, Part 11 Geology and Soils, June 1993
- Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency, Model Procedures for the Management of Land Contamination, Contaminated Land Report (CLR) 11, September 2004
- Department for Transport, National Policy Statement for National Networks, December 2014

9.2.2 The objective at this stage is to identify the attribute importance of geology, geomorphology and soils, and the significance of potential effects upon them, to be taken into account when refining the scheme options. There is also a requirement to establish the potential for land contamination within the study area.

POTENTIAL FOR LAND CONTAMINATION

9.2.3 The potential for land contamination within the study area has been assessed in accordance with the principles of the Environment Agency (EA) report CLR11. In the context of current UK Government guidance, qualitative risks on land contamination are to be assessed using a 'Source-Pathway-Receptor' methodology, where the following definitions apply:

- Source (or hazard): a substance or situation which has the potential to cause harm or pollution
- Pathway: means by which the source/hazard can reach and impact upon a receptor
- Receptor: that which may be adversely affected by the presence of the source/hazard

9.2.4 This approach, which forms the basis of the contamination risk methodology used in this assessment, recognises that risks from site based contamination can only exist when there is a source, pathway and receptor, resulting in a complete contaminant linkage.

9.2.5 Risks have been evaluated on a qualitative basis, in accordance with the methodology set out within CIRIA C552: Contaminated Land Risk Assessment – A Guide to Good Practice. This involves classification of the magnitude of the potential consequences of the risk and the probability of the risk occurring. These classifications are then compared to determine the risk presented by each identified contaminant linkage.

9.2.6 The framework for determining the classification of the consequences is detailed within Table 9-1. The classification does not account for the probability of the consequences being realised. The 'severe' classification relates only to acute risks (arising from short-term exposure). The 'medium' classification relates to chronic harm (which may still be classified as 'significant harm' under Part 2A).

Table 9-1: Qualitative risk assessment – classification of consequence

CLASSIFICATION	DEFINITION
Severe	Short term (acute) risks to human health, likely to result in significant harm. Short-term risk of pollution of sensitive water resource. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.
Medium	Chronic damage to human health (significant harm). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or to the environment.
Minor	Harm, not necessarily significant, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health. Easily repairable effects of damage to buildings, structures and services.

9.2.7 The framework for determining the classification of probability is detailed within Table 9-2.

Table 9-2: Qualitative risk assessment – classification of probability

CLASSIFICATION	DEFINITION
High Likelihood	There is a contaminant linkage and an event that appears very likely in the short term, and/or almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	It is probable that an event will occur. Whilst not inevitable, it is possible in the short term and likely over the long term.
Low Likelihood	Circumstances are possible under which an event could occur, but it is not certain that (even over a long time period) such an event would occur.
Unlikely	It is improbable that an event would occur, even in the very long term.

9.2.8 Once the consequence and probability have been determined for a contaminant linkage, these can be compared to produce a risk category, ranging from 'very high risk' to very low risk' as shown in Table 9-3.

Table 9-3: Comparison of consequence against probability

		SEVERITY			
		Severe	**Medium**	**Mild**	**Minor**
PROBABILITY	**High Likelihood**	Very high risk	High risk	Moderate risk	Moderate / low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate / low risk	Low risk	Very low risk	Very low risk

VALUE (SENSITIVITY) OF RESOURCES AND RECEPTORS

9.2.9 Environmental values have been assigned to each identified receptor in accordance with the principles established in Volume 11, Section 2, Part 5 of the DMRB (2008). Consideration must also be given to the potential for any post-construction environmental effects, caused by remobilisation of ground contamination following disturbance during the construction process. An environmental value has therefore also been assigned to the potential land contamination receptors, as identified within the conceptual site model (CSM).

9.2.10 The environmental value of the receptor is qualitatively described in Table 9-4.

Table 9-4: Defining attribute Importance (sensitivity) for resources / receptors

VALUE (SENSITIVITY)		**HIGH**	**MEDIUM**	**LOW**
ATTRIBUTES	**Geology & Geomorphology**	Geological or geomorphological features of national importance (SSSI) or mineral resource	Regionally Important Geological Sites (RIGS). Within a mineral resources safeguarded area.	No features of importance in close proximity
	Soils	Good to excellent quality agricultural land	Poor to moderate quality agricultural land	Very poor quality agricultural land, Made Ground, with little potential for farming use
CONTAMINATION LAND RECEPTORS	**Controlled Waters**	Principal aquifer beneath site, and/or major surface water in close proximity	Secondary aquifer beneath site and/or minor surface water in close proximity	Aquitard or aquiclude beneath site, no surface water body in close proximity
	Ecological Systems	Nationally or internationally designated ecological sites	Locally designated ecological sites	No sites of significant ecological value in close proximity
	Built Environment	Buildings of high historic value or other high sensitivity	Buildings, including services and foundations	Not applicable
	Construction Workers	Extensive earthworks including demolition of buildings	Limited to moderate earthworks	Minimal disturbance of ground
	End Users	Residential development, allotments, play areas	Landscaping or public open space	'Hard' end use (e.g. industrial use, road, car park)

SIGNIFICANCE CRITERIA

9.2.11 The assessment of potential effects, as a result of the proposed development, has taken into account both the construction and operational phases. The construction phase includes enabling works, demolition, earthworks and construction activities. The significance level attributed to each effect has been assessed based on the magnitude of change due to the proposed development and the sensitivity of the affected receptor, as well as a number of other factors that are outlined in more detail in Chapter 4: Environmental Assessment Methodology.

9.2.12 The risks associated with land contamination have been assessed with regards to guidance provided in '*Model Procedures for the Management of Land Contamination' (CLR11)* by the EA as described below.

9.3 BASELINE CONDITIONS

9.3.1 The baseline conditions at the scheme area have been assessed with reference to the following sources of information:

- Site walkover in April 2016
- Envirocheck Report, Landmark, reference 85178192_1_1 dated April 2016 (Technical Appendix 9.1)
- British Geological Society (BGS) 1:50,000 Series Geological Map Sheet No. 299 'Winchester' (Solid and Drift ed.), 2002
- British Geology Survey online 'Geology of Britain" Viewer (http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer/)
- British Geological Survey web-hosted Onshore Geoindex (http://www.bgs.co.uk/geoindex/)
- Environment Agency, What's in your Backyard? (http://apps.environment-agency.gov.uk/wiyby/default.aspx)
- Hampshire County Council - Minerals and Waste Planning Policy in Hampshire, (http://www3.hants.gov.uk/mineralsandwaste/planning-policy-home.htm)
- MAGIC map geographic information about the natural environment (http://www.magic.gov.uk/home.htm)

GROUND CONDITIONS

MADE GROUND

9.3.2 Whilst Made Ground is not indicated as being located on the scheme area on BGS mapping, it is likely to be present along the alignment of the existing road associated with the construction of the road.

9.3.3 Made Ground is indicated approximately 250m to the west of the scheme area associated with previous landfilling activities, which are discussed further below.

SUPERFICIAL DEPOSITS

9.3.4 Superficial deposits are limited across the scheme area. Alluvium overlies the chalk strata in the north/north-east and north-west of the site in the vicinity of the River Itchen. Two bands of superficial Head deposits run perpendicular across the M3/A34/A272 in a west-east direction, located to the north and south of the existing M3 J9 junction respectively.

9.3.5 River Terrace (sand and gravel) Deposits and Head Deposits may also encroach onto the north-west and northern extents of the scheme area associated with the River Itchen.

9.3.6 In addition to the above, peat deposits are also recorded in BGS borehole logs in the vicinity of the M3 J9.

SOLID GEOLOGY

9.3.7 The scheme area is underlain by the Seaford Chalk Formation described as firm white chalk with nodular and tabular flint seams. A small outcrop of the Newhaven Chalk Formation may be present on the eastern boundary of the scheme. The Lewes Nodular Chalk Formation underlies the Seaford Chalk Formation immediately south of the scheme.

9.3.8 The geological map suggests that the Seaford Chalk is approximately 40-65m thick in this area and dipping 5°–10° towards the north.

9.3.9 BGS borehole records were reviewed from along the existing alignment of the M3. These indicate that Chalk strata have been proven up to at least 45.72m below ground level (maximum drilled depth). The Seaford Chalk which is located near the ground level is weathered and described as 'structureless clayey chalk with occasional presence of flints'. It is possible that the Head deposits described in the borehole logs as 'brown clay with scattered flints' (Borehole record ref: SU43SE55) may constitute weathered Seaford Chalk deposits.

GROUND STABILITY

9.3.10 Potential stability hazards at the site as described in the Envirocheck Report are presented in Table 9-5 below.

Table 9-5: Stability hazards

TYPE OF INSTABILITY	RISK
Collapsible Ground	No Hazard - Very Low
Compressible Ground	No Hazard – Moderate
Ground Dissolution	Very Low – Moderate
Landslide	No Hazard – Low
Running Sand	No Hazard – Low
Shrinking or swelling clay	No Hazard - Very Low

9.3.11 Multiple solution features are recorded approximately 190m north-west of the study area associated with the underlying chalk strata.

9.3.12 The site is located within a lower probability area for radon, as less than 1% of homes are above the action level.

MINING AND MINERAL RESOURCES

9.3.13 Mineral resources comprising sharp sand and gravel are located in the vicinity of the River Itchen in the northern part of the scheme area, identified by Hampshire County Council's Mineral and Waste Plan. Mineral resources identified through the Plan are subject to potential safeguarding under Policy 15.

9.3.14 A concrete manufacturing plant (Easton Lane depot) is located immediately adjacent to the eastern boundary at the southern extent of the study area. This is considered to be a safeguarded site under Hampshire County Council's Minerals and Waste Plan.

9.3.15 The nearest BGS recorded mineral site is a historic opencast chalk mine located approximately 15m-85m east of the north-eastern boundary of the scheme area.

AGRICULTURAL LAND QUALITY

9.3.16 The majority of the site is classified as Agricultural Land Classification (ALC) Grade 3 (good to moderate) with non-agricultural land and ALC Grade 4 (poor) to the west and south of the scheme area. The ALC map on which this review is based (published in 2010) is part of a series at 1:250,000 scale, and are not intended for use in the assessment of individual sites.

HYDROGEOLOGICAL CONDITIONS

9.3.17 The chalk beneath and surrounding the scheme area is classified by the EA as a Principal Aquifer.

9.3.18 The alluvial deposits are classified as Secondary A and Head deposits as a Secondary (undifferentiated) Aquifer.

9.3.19 The northern boundary of the scheme area is located within an inner zone (Zone I) of a groundwater Source Protection Zone (SPZ), associated with Easton Pumping Station to the north-east. A second Zone I SPZ is located approximately 325m north-west of the scheme area associated with Springvale abstraction boreholes.

9.3.20 The EA Water Abstraction Licences map shows there to be a large groundwater abstraction used for various purposes within the north section of the scheme area. A second, large groundwater abstraction used for agriculture is located approximately 875m to the north-west of the scheme area.

9.3.21 The Envirocheck report shows two discharge consents to groundwater within the scheme area, neither of which is active.

9.3.22 Two groundwater abstraction licenses are recorded within, and to the north-east of, the scheme area for Southern Water Services Ltd for public potable water supply.

9.3.23 The groundwater body underlying the scheme area (River Itchen Chalk) is classified as having poor chemical and quantitative quality; and is considered to be at risk.

HYDROLOGICAL CONDITIONS

9.3.24 The scheme options are situated in the immediate vicinity of the River Itchen; one of the options (Option 11) crosses the river in three locations, whilst the remaining options are located approximately 35m–400m from the river. The River Itchen extends across the north and north-west of the study area and is characterised by the EA as being of poor ecological quality with a chemical quality rated as failed. It is noted that the River Itchen is heavily modified within the scheme area.

9.3.25 Two pollution events to controlled waters are recorded on site. A category 3 (minor incident) manure spillage occurred in 1992 to the north-west of the site and a category 3 fuel spillage occurred in 1995 in the southernmost part of the scheme area.

9.3.26 The hydrological conditions at the site are discussed in more detail in Section 13 Road Drainage and the Water Environment.

STATUTORY DESIGNATIONS AND ENVIRONMENTALLY SENSITIVE SITES

9.3.27 The River Itchen is designated as a SSSI and SAC due to its ecological status. The scheme area, with the exception of the existing junction itself lies within the SDNP.

HISTORICAL & EXISTING LAND USE

9.3.28 According to the earliest publically available historic map (dated 1870), the study area comprised agricultural fields with the village of Headbourne Worthy located to the north-west, Kings Worthy to the north and the City of Winchester located to the south-west.

9.3.29 A summary of the historical land use within the scheme area and the surrounding 250m study area is provided in Table 9-6 below.

Table 9-6: Summary of historical land use

FORMER USE	MAP DATES	COMMENTS
Smithy	1874 – 1898	A small smithy was located approximately 200m west of the north-western extent of the scheme area.
Chalk Pits	1874 – 1960s (shown as disused in 1969)	A number of open chalk pits are located in the vicinity of the scheme area. The closest is shown adjacent to the east of the north-eastern extent of the scheme area.
Didcot Newbury & Southampton Railway Line	1897 -1969	A railway line cross the north-west section of the scheme area and continues to run along the western scheme area boundary. By 1969 the railway is shown as dismantled, although embankments are still present.
Vulcan Iron Works / Factory	1897 – Present	A small iron works is shown approximately 100m north of the north-western extent of the scheme area. By 1962 the works have extended to abut the north-western scheme area extent.
Winchester By Pass (A34)	1947 – Present	A new road runs across the scheme area from south-east to north-west on a 1947 aerial photo and is subsequently shown on later OS mapping. By 1977 the existing bypass has been expanded with a new spur (A33) running to the north-west along the route of the former railway line.
Gas Works	1910 – 1966 (Gasometer remainder until 1989)	A small gas works is shown approximately 100m west of the western boundary of the scheme area extent from 1910. The Gas Works consisted of nine buildings or structures. By 1931 the works had expanded with two additional gasometers and buildings. A gasometer was located approximately 50m west of the scheme area.
Engineering Works & Saw Mills / Industrial Estate	1969 – Present	By 1969, a saw mill and engineering works are present adjacent to the gas works site. The buildings remain to present day.
Abattoir / Works / Warehouses	1931 – Present	A triangular parcel of land to the south-west of the scheme area is shown as an allotments / storage area from 1931. By 1962 the area is occupied by a number of large warehouse / factory buildings. These are later labelled as Winchester Abattoir, works, warehouses, garages and

FORMER USE	MAP DATES	COMMENTS
		depot. By 1977 the industrial estate / warehouse to the south-west has expanded to the north, along the route of the A33/A34 to join up with the former gas works complex.
M3	1980s to Present	The M3 is first shown on available OS mapping from 1983 running south to north through the scheme area.
Depot	1990s to Present	A depot comprising of two large industrial buildings and associated storage areas is present on the south-western portion of the site off the A33.

LANDFILL SITES

9.3.30 Two recorded landfills are present within the scheme area. They are located in the north between the M3 and Winchester Bypass (landfill adjacent to the River Itchen) and in the southern part of the scheme area, beneath the existing M3/A34 interchange (Spitfire Link Landfill). Land between the M3 and Winchester bypass was subject to waste deposition between 1967 and 1968 and was recorded to comprise inert waste. No information is available for the Spitfire Link landfill site.

9.3.31 A further landfill site is located approximately 250m west of the scheme area.

POTENTIAL FOR LAND CONTAMINATION

9.3.32 Where land has been contaminated as a result of former industrial or agricultural process's, this has the potential to be a constraint on all design options. Consideration must be given to the potential for any post construction impacts, due to the potential for remobilisation of contamination within ground disturbed by the construction processes.

SOURCES

9.3.33 A summary of potentially contaminative land uses is shown in Table 9-7 below.

Table 9-7: Contaminative land uses

PROCESS / LAND USE	LOCATION	CONTAMINANT GROUPS POTENTIALLY PRESENT ON-SITE
Use as a motorway. Potential Made Ground associated with the existing roads and potential infilling of surrounding quarries	Along the route alignment in areas of existing road and surrounding the scheme area in various locations	Metals and metalloids, polycyclic aromatic hydrocarbons (PAHs), oil/fuel hydrocarbons, sulphates, asbestos, landfill gas, acids, ammonia.
Agricultural land	Along the route alignment	Hydrocarbons and lubricating oils associated with machinery and nitrates from fertilisers. Potential pesticides and herbicides.
Landfills (Inert, industrial, commercial, household, special waste, liquids or sludge wastes)	Historically in the south of the scheme area by the roundabout and in the north. Adjacent to the route alignment at various locations	Metals and metalloids, polycyclic aromatic hydrocarbons (PAHs), oil/fuel hydrocarbons, sulphates, asbestos, landfill gas, leachate, acids, ammonia.
Industrial land uses	Adjacent to the scheme area	Metals and metalloids, polycyclic aromatic hydrocarbons (PAHs), oil/fuel

PROCESS / LAND USE	LOCATION	CONTAMINANT GROUPS POTENTIALLY PRESENT ON-SITE
		hydrocarbons, sulphates; asbestos.
The historic railway line	To the north-west of the scheme area	Metals and metalloids, polycyclic aromatic hydrocarbons (PAHs), oil/fuel hydrocarbons, lubricating oils, creosotes, sulphates, asbestos.

CONCEPTUAL SITE MODEL (CSM)

9.3.34 The CSM is developed based on the end us as a public highway and does not consider any mitigation measures, as presented in Table 9-8 below.

Table 9-8: Preliminary conceptual site model

SOURCE	PATHWAY	RECEPTOR	CONSEQUENCE	PROBABILITY	RISK
General localised areas Made Ground associated with previous land use	Direct contact, ingestion and inhalation of soils and groundwater. Inhalation of windblown dust	End Users	Medium	Unlikely	Low Risk
		Construction Workers	Medium	Low Likelihood	Moderate to Low Risk
	Lateral migration of aqueous and dissolved contamination via groundwater flow or preferential pathways	Surface Waters	Medium	Likely	Moderate
	Vertical migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways	Groundwater	Medium	Unlikely / Low Likelihood	Moderate to Low Risk
	Chemical attack and degradation	Buildings (buried concrete structures)	Mild	Low Likelihood	Low

ATTRIBUTE IMPORTANCE

9.3.35 The following section considers the receptors likely to be most impacted at the construction and operational stages of the scheme. The sensitivity has been determined using the descriptive scale offered within Table 9-4.

ATTRIBUTE: GEOLOGY AND GEOMORPHOLOGY

9.3.36 The scheme area does not lie within an area where nationally important geological or geomorphological features have been recorded (geological SSSIs) and there are no regionally important geological sites within the area. The sensitivity of this attribute is therefore assessed as being Low**.**

ATTRIBUTE: SOILS

9.3.37 The scheme is associated with predicted ALC Grade 3 (moderate to good) and predicted Grade 4 (poor) agricultural land. The sensitivity of this receptor is therefore assessed as being Medium.

CONTAMINATED LAND RECEPTOR: GROUNDWATER

9.3.38 The aquifers beneath the scheme area have been classified as Principal and Secondary A aquifers. Also, the northernmost part of the scheme area lies within a Zone 1 SPZ. Two abstraction points for potable drinking supply are also located in the north of the scheme area. The sensitivity of this receptor is therefore assessed as being High.

CONTAMINATED LAND RECEPTOR: SURFACE WATERS

9.3.39 The River Itchen flows through the north and along the west of the scheme area with several associated water courses. The River Itchen is designated a SSSI and a SAC. The sensitivity of this receptor is therefore assessed as being High.

CONTAMINATED LAND RECEPTOR: ECOLOGICAL DESIGNATIONS

9.3.40 The nearest Environmentally Sensitive Area is the River Itchen valley which is designated as a SSSI and a SAC. The sensitivity of this receptor is therefore assessed as being High.

CONTAMINATED LAND RECEPTOR: THE BUILT ENVIRONMENT

9.3.41 Residential, school and commercial properties are described in section 2.3. The sensitivity of this receptor is therefore assessed as being Medium.

CONTAMINATED LAND RECEPTOR: CONSTRUCTION WORKERS

9.3.42 The scheme is considered to potentially encompass extensive earthworks and whilst it is considered that best practice and appropriate health and safety controls will be implemented during construction, the sensitivity of this receptor is assessed as being Medium.

CONTAMINATED LAND RECEPTOR: EXISTING AND PROPOSED END USERS

9.3.43 The sensitivity of existing and proposed end users of the scheme is considered to be Low as the scheme is to remain predominantly a ‘hard end use’; there will be little exposure to the underlying soils and geology.

9.4 REGULATORY AND POLICY FRAMEWORK

9.4.1 The planning policy documents and the legislative context in relation to the assessment of the environmental effects on the geology and soils are set in Appendix 2.1 covering European, UK, National Level policies. The list is not intended to be exhaustive but includes the main documents relating to the protection, preservation and, where appropriate, enhancement of the geological environment.

9.4.2 Local Planning Policies which are applicable to the assessment of impacts to Geology and Soils are listed below:

- The Hampshire Minerals and Waste Plan 2013 (HMWP): Policy 15 (Safeguarding - mineral resources) of the HMWP provides the policy framework for mineral resource safeguarding in Hampshire
- The regulatory framework with respect to the assessment of impacts on Geology and Soils is focused on the protection of receptors from impacts associated with the release / mobilisation of contamination or the deterioration in soil quality / sterilization of mineral resources during and post construction works

- The key objective set out in the various planning frameworks and policies is that the Site must not be determinable as Contaminated Land under Part II A of the Environmental Protection Act 1990; or knowingly allow harm / impact to a sensitive receptor
- The currently regulatory framework will require consideration for potential contamination risks to be present and appropriate control measures installed as part of the design. Based on the current scheme options, these are considered to represent standard construction / development design principles which would be included and evolved as part of the standard design process
- The approach to such assessments and subject design of appropriate control / mitigation measures if clearly set out in the applicable guidance documents and no deviations from this approach is anticipated

9.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

9.5.1 Detailed design and mitigation measures are not available at this stage of the design. An assessment of the detailed scheme design and proposed mitigation measures will be undertaken at a later stage in the design process when detailed information is available.

9.5.2 Ground investigation works will be required to characterise the existing ground conditions in relation to the CSM (to include consideration of soil, groundwater, ground gas, and geotechnical parameters). The works should be completed in accordance with BS 10175:2011, CLR11, and any other relevant standards and guidance. Future design work will utilise the information obtained.

9.5.3 The potential aggressivity of ground conditions to concrete should be investigated during the ground investigation. The concrete type used across the scheme will be tailored to the ground conditions present to prevent the risk of future attack. As such, risks associated with ground aggressivity would be minimal.

9.5.4 The construction of all earthworks and rock cuttings along the alignment of the scheme would be designed to an appropriate factor of safety to minimise the potential for slope instability. These profiles should maintain long term slope stability and obviate the need for direct, active slope stabilisation measures during construction.

9.5.5 A CEMP is required to outline the mitigation, control and monitoring measures to be put in place to minimise the impact of the development options on ground conditions, land quality and water resources during the construction process.

9.5.6 Construction work will proceed in adherence to the following documents:

- Protection of Workers and the General Public during the Development of Contaminated Land, Health and Safety Executive (HSE), 1991. This document establishes the key principles to take into account when designing and implementing work on contaminated sites to ensure the proper protection of the health and safety of employees and others who may be affected by such work
- A Guide to Safe Working on Contaminated Sites, R132, CIRIA, 1996. This document is similar to the HSE document but also includes checklists to help in the preparation of health and safety risk assessment and the development of safe working practices, etc

9.5.7 There is the potential for soils to be retained and re-used, either as part of the development options, landscaping works or other design requirements. The CEMP will specify measures relating to the earthworks machinery used, methods of handling, and storage conditions, to reduce the level of damage and deterioration in soil quality during storage and transit.

9.6 OVERALL ASSESSMENT

9.6.1 The extent of the physical works is yet to be fully determined. This assessment therefore provides only a high level consideration of the potential construction phase and operation phase impacts.

9.6.2 The baseline assessment has identified potential sources of Made Ground including landfilling within the study area and a number of contaminative uses within 250m of the scheme options.

9.6.3 The proposed scheme options all include a similar amount of earthworks within areas of potential Made Ground and in proximity to existing road and property infrastructure. Option 11 however, may pose the greatest risk to the pollution of identified water features and disturbance of soils / land contamination. This is primarily due to Option 11 needing the largest scale of works as the proposed alignment is longer than the other options and the need for the alignment to cross the River Itchen in three locations (the other options do not cross the river).

9.6.4 Whilst Option 11 will include a greater degree of earthworks, it is considered that the impacts of the proposed option will be of a similar magnitude and consequence, and therefore the effects of the various options on geology and soils have been assessed together.

SUMMARY OF EFFECTS

9.6.5 A summary of effects is presented in Table 9-9 and detailed in paragraphs below.

Table 9-9: Summary of effects

ASPECT	SENSITIVITY	MAGNITUDE OF IMPACT	SIGNIFICANCE OF EFFECT
Geology & Geomorphology	Low	Negligible	Neutral or Slight Adverse
Soils	Medium	Negligible	Neutral or Slight Adverse
Groundwater	High	Minor Adverse	Slight or Moderate Adverse
Surface Water	High	Moderate Adverse	Moderate or Large Adverse
Ecology	High	Moderate Adverse	Moderate or Large Adverse
Built Environment	Medium	No Change	Neutral or Slight Adverse
Construction Workers	Medium	Minor Adverse	Slight Adverse
Existing & Proposed	Low	Negligible	Neutral or Slight Adverse

ASPECT	SENSITIVITY	MAGNITUDE OF IMPACT	SIGNIFICANCE OF EFFECT
Future Users			

GEOLOGY, GEOMORPHOLOGY AND MINERAL RESOURCES

9.6.6 Whilst the construction phase will include construction of embankments and also include areas of cut, these options will not result in any significant geological or geomorphological change. A Materials Management Plan will be utilised for these areas. There are no geological features of importance such as SSSIs and RIGs therefore this is anticipated to be a Neutral or Slight Adverse effect for all the options.

SOILS AND AGRICULTURAL LAND

9.6.7 The options are not considered to affect land that would be used for agriculture despite being within a Grade 3 area and is therefore likely to lead to a Neutral or Slight Adverse effect for all the options.

GROUNDWATER

9.6.8 During the construction phase of the scheme, there is the potential for the creation of new migratory pathways for contamination. Groundwater sensitivity, based on the presence of the principal aquifer, SPZ and abstraction points is high. There is the potential for elevated concentrations of determinands in the soils based on current and historic land use. Although further site-specific information is required for an accurate assessment, a Slight or Moderate Adverse effect is expected.

SURFACE WATERS

9.6.9 During the construction phase of the scheme there is the potential for the mobilisation of soil/sediment, both natural and potentially contaminated which could impact surface waters, altering ecological parameters. Surface water features in the vicinity of the site include the River Itchen which is a SAC and a SSSI. Due to the sensitivity of the receptors and the potential impact that could occur after mitigation there is the potential for a temporary Moderate to Large Adverse effect during construction for all the options.

ECOLOGICAL SYSTEMS

9.6.10 As above, the River Itchen is a SAC and SSSI, therefore a Moderate to Large Adverse effect is expected for all the options.

BUILT ENVIRONMENT / INFRASTRUCTURE

9.6.11 Chemicals that are destructive to concrete have the potential to constrain the design of the preferred option. The chemicals most likely to attack concrete are sulphates and acids. However, any aggressive ground conditions along the scheme would be identified in a Ground Investigation Report and concrete and structure designed accordingly. Therefore no change is predicted and the significance of effect is expected to be Neutral for all the options.

9.6.12 The depot located within the study area may be affected during the construction works. The end use/built environment is considered of medium sensitivity.

9.6.13 Ground gas can migrate and accumulate within subsurface structures, including utility corridors and culverts. The built environment may be impacted by ground gas during the construction of the

scheme. The risk associated with potential gas generation from organic matter within the superficial deposits and bedrock cannot be discounted at this stage and will be assessed within the ground investigation. There is expected to be an impact of Slight Adverse significance for all of the options.

CONSTRUCTION WORKERS

9.6.14 There is the potential for adverse impacts to health due to oral, inhalation or dermal contact with potential contaminants within soils during any ground disturbance. Baseline soil quality data is not available; however it is considered that concentrations of contaminants of concern would potentially pose a risk to construction workers. This can be further refined during a ground investigation and subsequent analysis of the soils. Excavation works and materials handling associated with construction of the scheme would create the potential for adverse impacts to the health of construction workers, by the generation of soil derived dusts. Therefore, it is considered that there will be a Slight Adverse effect for all of the options.

END USERS

9.6.15 There is the potential for adverse impacts to health due to oral, inhalation or dermal contact on existing land users surrounding the scheme during any ground disturbance. End users are likely to be limited and direct contact with potentially contaminated material post-construction will be limited due to the presence of the roadway. It is considered that there will be a Neutral or Slight Adverse effect for all of the options.

9.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

9.7.1 At time of writing a Preliminary Risk Assessment (PRA)/Preliminary Sources Study Report or ground investigation has not been completed. As a result, the assessment has been carried out using desk-based assessment and publically available data only.

9.7.2 Once the preferred option has been decided upon an intrusive assessment will be required to confirm the anticipated ground conditions, confirm absence of significant sources of contamination and obtain information that will be required to enable the detailed design i.e. geotechnical and hydrogeological parameters.

9.8 SUMMARY

9.8.1 The scheme options involve widening and re-alignment of the existing road network associated with M3 J9 which will involve a degree of earthworks. Whilst the scheme options vary in design, it is considered that the impacts and associated effects on geology and soils from the various options are likely to be similar given the sensitivity of the receptors and likely significance and that all five options potentially cutting through / excavating into the Spitfire Link Landfill

9.8.2 Option 18 where the extent of the earthworks and works within the River Itchen are minimal is the preferred option with respect to Ground Conditions and Contamination. Option 16B is considered to have the potential for the second least effects as it does not intend to disturb the Spitfire Link Landfill.

9.8.3 Options 14 and 16A are ranked joint 2nd preferred options as they involve a similar degree of disturbance and excavation within the Spitfire Link Landfill.

9.8.4 Option 11, is considered to pose the greatest risk of impacts occurring due to the largest extent of the earthworks and the requirement for works within the River Itchen.

9.8.5 The effects from the proposed works are considered to be as follows:

- Geology & Geomorphology, Soils, Built Environment and Future End Users – Neutral or Slight Adverse Effect
- Construction Workers – Slight Adverse Effect
- Groundwater – Slight or Moderate Adverse Effect
- Surface Water & Ecology – Temporary Moderate or Large Adverse Effect

9.8.6 Options which limit the degree of earthworks in particular in the vicinity of the River Itchen and former landfilled areas are preferred. Where possible work in the vicinity of landfilled areas should be avoided.

10 MATERIALS

10.1 INTRODUCTION

10.1.1 This chapter assesses the effects of the use of materials and generation of waste associated with the scheme options. It is broadly based on guidance in IAN 153/11 (Highway Agency, 2011) on the environmental assessment of material resources.

10.1.2 The assessment of materials considers the use of material resources and the generation and management of waste. It does not include the direct energy use associated with operation of the network. Material resources include the materials and construction products required for implementation of the scheme options, both in terms of raw materials and manufactured items.

10.2 ASSESSMENT METHODOLOGY

10.2.1 The guidance in IAN 153/11 states that a 'Simple Assessment' should be undertaken before detailed design. The Simple Assessment assembles data and information that is readily available to address potential effects identified before detailed design information is available.

10.2.2 This assessment follows the methodology set out in Chapter 4 of this ESR, including the approach to the assessment of significance. The sensitivity of the receptor is dependent on the capacity of the local environment to provide materials or dispose of waste (i.e. the capacity of available waste management infrastructure). Predicted quantities of materials to be used and the waste forecasts, based on professional judgement, have been used to identify the magnitude of an impact.

10.2.3 The material requirements and waste generated by the five scheme options is not known due to the limited design information available at this early stage in the design process. Furthermore, material sources are unknown. Calculations of waste arisings (for instance for the earth works balance) will be developed by the construction contractor for the preferred option, once it has been selected. This chapter therefore provides a high level assessment of the impacts associated with materials use and waste generated by the scheme options.

10.3 BASELINE CONDITIONS

MATERIALS

10.3.1 The scheme options will require materials in order to facilitate the production of new areas of highway, the widening of existing highway, and other upgrades to existing road features such as roundabouts. The scheme options are likely to vary substantially in terms of material usage due to their differences in scale, but are likely to use the same broad categories of materials, including primary materials, such as aggregates, or secondary, recycled materials brought in from off-site, possibly produced by another nearby construction project.

WASTE

10.3.2 The scheme options will result in the production of surplus material during the construction process which may need to be disposed of as waste. Surplus material is likely to arise from excavations for the new carriageways or carriageway widening, from the demolition of existing infrastructure, and from materials brought to site that are not used for their original purpose (such as damaged or over-ordered goods). However, much of the surplus material can be used either on site or on elsewhere. A summary of the likely materials to be used and potential waste arising from the scheme are provided in Table 10-1.

Table 10-1: Typical materials and waste required and generated by highways schemes

SCHEME PROCESS	TYPE	POTENTIAL USE	POTENTIAL WASTE
Site Clearance	Concrete		✓
	Bricks		✓
	Concrete/Bricks Mix		✓
	Wood		✓
	Bitmac (road planings)		✓
	Iron and Steel		✓
	Mixed metals		✓
	Plastics		✓
	Soil and Stone	✓	✓
	Type 5 A (topsoil/turf)	✓	✓
	Type 2 (general excavation/fill)	✓	✓
	Type 4 (landscaping/topsoil)	✓	✓
	Type 6F1 & 2 (aggregates)	✓	✓
	Vegetation		✓
Site Construction	Concrete	✓	✓
	Bricks	✓	✓
	Wood	✓	✓
	Bitmac		
	Base, binder and wearing courses	✓	✓
	SLX tack coast	✓	
	Iron and Steel	✓	✓
	Mixed Metals	✓	✓
	Plastic	✓	✓
	Soil and Stone		
	Type 1 (803 sub-base/capping)	✓	✓
	Type 503 (pipe bedding)	✓	✓
	Type 505 (pipe filter material)	✓	✓
	Reclaimed Hedging Stone	✓	
	Type 5 A (topsoil/turf)	✓	✓
	Type 2 (general excavation/fill)	✓	✓
	Type 4 (landscaping/topsoil)	✓	✓
	Vegetation	✓	
Site Operation/ Maintenance	Concrete	✓	✓
	Bricks	✓	✓
	Wood	✓	✓
	Bitmac		

SCHEME PROCESS	TYPE	POTENTIAL USE	POTENTIAL WASTE
	Base, binder and wearing courses	✓	✓
	SLX tack coast	✓	✓
	Iron and Steel	✓	✓
	Mixed Metals	✓	✓
	Plastic	✓	✓
	Soil and Stone		
	Type 5 A (topsoil/turf)	✓	✓
	Type 2 (general excavation/fill)	✓	✓
	Type 4 (landscaping/topsoil)	✓	✓
	Type 6F1 & 2 Aggregates	✓	✓
	Type 1 (803 sub-base / capping)	✓	✓
	Type 503 (pipe bedding)	✓	✓
	Type 505 (pipe filter material)	✓	✓
	Reclaimed Hedging Stone	✓	✓
	Vegetation		✓

10.3.3 The Hampshire Mineral and Waste Plan 2013-2030 states that Hampshire currently produces around 4.8 million tonnes of waste per annum and that there will be a shortfall in non-hazardous waste management capacity by 2030. As of 2011 over 50% of this waste is recycled and only 18% of waste enters landfill sites. Policy 25 of the Plan (sustainable waste management) outlines the goals of 60% recycling and 95% diversion from landfill by 2020.

10.3.4 Construction and demolition waste accounts for the largest proportion of the waste stream in the UK. In 2010, this was approximately 67% of the total waste produced in the UK (Defra, 2006).

WASTE MANAGEMENT INFRASTRUCTURE

10.3.5 Hampshire aims to 'virtually eliminate' waste going to landfill by 2030 by providing more recycling and waste management facilities in the county. Currently Hampshire contains a mature network of waste management facilities for waste recycling and recovery.

10.3.6 By 2030 it is predicted that Hampshire requires:

- → An additional 0.668 mtpa of non-hazardous recycling and recovery capacity
- → An additional 1.41 mt of non-hazardous landfill capacity
- → No additional capacity for inert waste

10.3.7 It is generally recognised that there is a shortage of strategic waste management facilities in the UK and an increase in waste management infrastructure is required to manage waste in the future.

10.4 REGULATORY AND POLICY FRAMEWORK

10.4.1 Material and waste policy is present at European, National and Local levels. The overarching framework is provided by the EU Waste Framework Directive (2008/98/EC) which has provided the basis for the UK's domestic waste and material policy. Targets set by the EU Waste

Framework Directive such as 70% recycling and reuse of construction and demolition wastes by 2020 has resulted in an increase in waste regulation that is relevant to Nationally Significant Infrastructure Protects (NSIPs), as well as policy devolving aspects of responsibility to local authority level. These include the National Policy Statement for National Networks 2014 (NN NPS) that sets out the that legal waste management requirements for NSIP delivery as well as the Waste Management Plan for England (2013) and National Planning Policy for Waste (2014) that provide the planning framework and require local authorities to improve and grow their waste management facilities at a local authority level respectively.

10.4.2 The Hampshire Minerals and Waste Plan (2013-2030) contains local policies that development within the county will be required to comply with to be granted planning permission. and the Plan provides county wide targets on recycling/reuse of construction, demolition and excavation wastes which the improvements at M3 J9 has the potential to contribute towards, such as the production of 1 million tonnes of recycled secondary aggregate per annum. Collective regulatory and policy framework background can be found in Appendix 2.1.

10.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

10.5.1 To limit potential impacts upon resources and demonstrate that decisions made during detailed design, construction and operation represent long term value for money, a number of measures for materials resource efficiency and waste have been considered.

MITIGATION INCLUDED IN DESIGN

10.5.2 A number of standard mitigation measures should be incorporated within the design of the preferred scheme option to limit material and waste impacts of the works and aim to reduce the requirement of additional imported materials. Currently there is not sufficient detail on the scheme options to determine which mitigation would be appropriate for each scheme option within this assessment.

10.5.3 The preferred scheme option should aim to minimise the export and import of fill materials. An example of how this could be achieved would be by balancing earthworks cut and fill volumes.

10.5.4 Topsoil stripped as a result of the works should be reused wherever possible in order to establish landscaping features such as embankments and verges as well as to provide a basis for landscape planting.

10.5.5 Where existing surfaces are to be replaced, this material should be re-used within the scheme.

MITIGATION INCLUDED IN CONSTRUCTION

10.5.6 Mitigation during construction should be managed through the implementation of an outline Site Waste Management Plan (SWMP) for the preferred scheme option at the detailed design stage.

10.5.7 The SWMP will aim to ensure that the waste produced during the construction phase is dealt with in accordance with the Duty of Care provisions in the Environmental Protection Act 1990.

DETAILED ASSESSMENT OF MATERIALS

10.5.8 A Detailed Assessment should be undertaken, once the preferred scheme option has been selected, to identify how the use of materials conforms to high level strategy targets outlined in the following policy documents:

- The EU Waste Framework Directive 2008
- The Waste (England and Wales) (Amendment) Regulations 2012

- National Planning Policy Framework 2012
- Waste Prevention Programme for England 2013
- Hampshire Mineral and Waste Plan 2013-2030

10.6 OVERALL ASSESSMENT

10.6.1 No information on the materials or waste generation associated with the scheme options is available at this early stage, however, in general it is assumed that options with a larger development footprint, and larger scale ground works, will produce a higher level of waste and require increased amounts of materials to complete.

OPTION 11

10.6.2 The proposed scale of construction is likely to require large quantities of primary and secondary aggregate in order to complete. Construction of new offline sections of road and widening of the existing road is expected to result in large scale production of waste through related ground works and construction spoil.

10.6.3 Option 11 has the potential to have a Moderate/Major Adverse impact on materials.

OPTION 14

10.6.4 Option 14 is expected to have similar impacts on materials to Option 11. Option 14 involves a similar range of construction operations to Option 11, however it will be undertaken over a smaller geographical area. Offline construction that is proposed for Option 14 is at a smaller scale than Option 11.

10.6.5 As a result of its smaller geographical scale Option 14 has the potential to have a Moderate Adverse impact on materials.

OPTION 16A

10.6.6 Option 16A involves similar works to Option 14, however is reduced in scale.

10.6.7 This option still has the potential to have a Slight/Moderate Adverse impact on materials as it involves much the same processes and construction requirements as Option 14.

OPTION 16B

10.6.8 Option 16B has the potential to have a Slight/Moderate Adverse impact on materials as a result of limited offline construction.

OPTION 18

10.6.9 Option 18 has the smallest scale of reconfiguration of the road layout and construction works of all the options proposed. Due to the construction of a new bridge there is the potential for a slight adverse impact on materials.

10.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

10.7.1 No detailed information on materials use or waste quantities generated is available at this stage of design. This assessment will be updated when more detailed information on materials and waste becomes available.

10.8 SUMMARY

10.8.1 Impacts on materials, including waste, are expected to vary between option due to their size and construction scope. At this stage there is the potential that the schemes with larger construction footprints will have large impacts on primary and recycled materials and result in increased waste production resulting from an increased requirement for groundworks.

10.8.2 Currently it has been predicted that Option 11 will likely have the largest impacts on materials due to its size, followed by 14, 16A and 16B. Option 18 will likely have the smallest impact on materials as it is the smallest option, however the likely impact of the options taken forward will be re-assessed in subsequent PCF Stages. Impacts to materials are expected to be reduced through mitigation measures such as the use of recycled materials and the implementation of a SWMP.

11 NOISE AND VIBRATION

11.1 INTRODUCTION

11.1.1 This chapter provides an assessment of the potential noise and vibration effects arising from the construction and operation of the scheme options on nearby sensitive receptors. Only human receptors are considered in this chapter; for the potential effects of noise and vibration on flora and fauna, see Chapter 8 Nature Conservation. Limited scheme information is available at PCF Stage 1 and there are no traffic data. The findings should be considered preliminary, with the primary objective of the assessment being to support the option identification process.

11.1.2 The scheme options have the potential to affect the noise and vibration levels experienced at nearby sensitive receptors due to changes in the road layout and operation of Junction 9 of the M3, along with any associated changes in vehicle numbers, mix and speed.

11.2 ASSESSMENT METHODOLOGY

11.2.1 A qualitative, constraints-based assessment has been undertaken at PCF Stage 1, based on available information and professional judgement.

11.2.2 With respect to the temporary construction phase, consideration has been given to the noise and vibration implications that might arise from:

- specific construction activities (e.g. piling, bridgeworks or creation of an underpass) that could generate significant noise and/or vibration effects
- construction activities that need to be undertaken at night
- speed restrictions during construction works or an increase in traffic on existing routes as a result of temporary diversions
- heavy and/or vibration generating construction plant operating sufficiently close to sensitive receptors to generate significant effects

11.2.3 The extent of the likely works has been identified for each scheme option, based on the number and length of new and improved links. Those lengths of existing highways that are to be removed have also been identified.

11.2.4 With respect to permanent operational effects, those factors that might affect the level of road traffic noise at any receptor have been identified:

- traffic related
- road related
- propagation
- receptor specific

11.2.5 In the absence of traffic flows and vehicle mix, consideration has been given to the potential for traffic speeds to increase and the effect that might have on road traffic noise and also whether new or realigned links might result in road traffic sources moving closer to nearest noise sensitive receptors (NSRs). Areas that could benefit from mitigation have been identified.

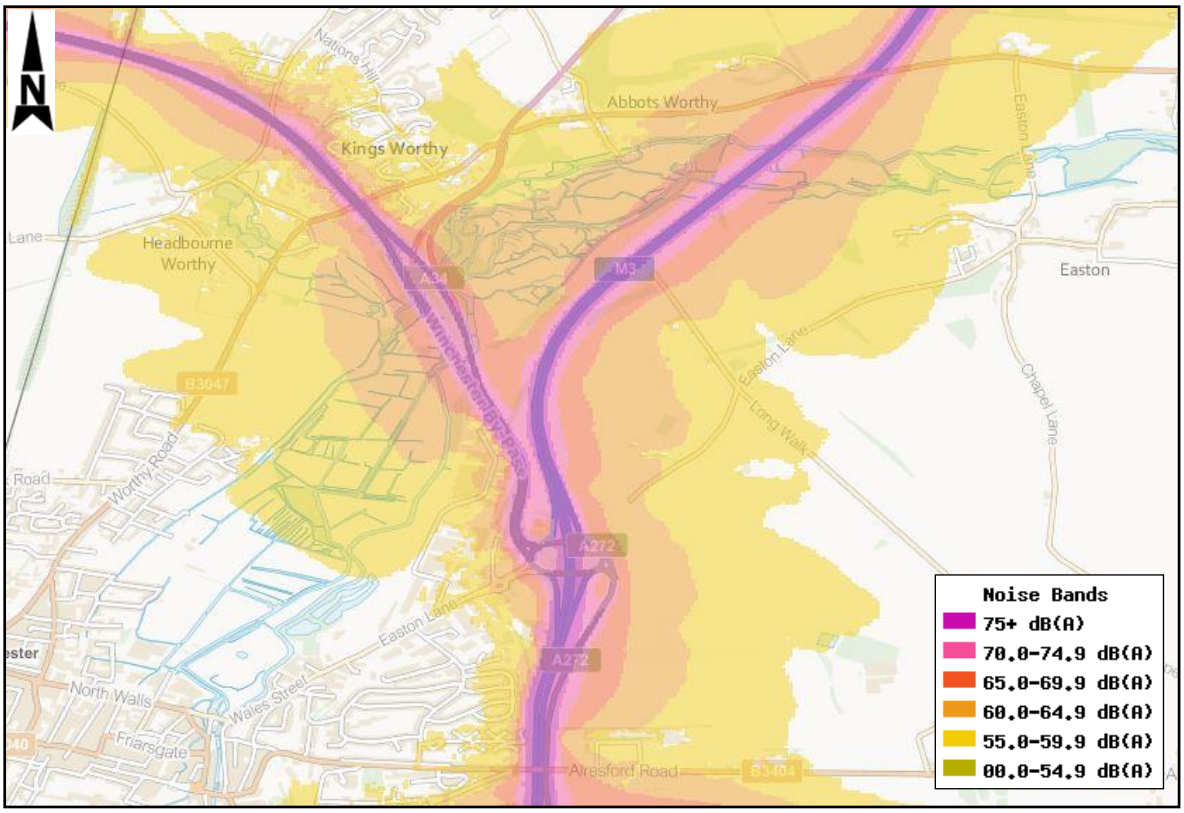
11.2.6 Based on the proximity of the nearest NSRs, the information gathered during the assessment and the possibility of employing mitigation to minimise effects, the potential for any of the options to cause significant adverse effects has been identified. Consideration has also been given to whether noise and vibration effects (temporary and permanent) might be a significant differentiator in the decision-making process to select a preferred scheme option.

11.3 BASELINE CONDITIONS

11.3.1 Defra noise mapping[29] identifies that the study area is currently affected by road traffic noise, predominantly from the M3, but to a lesser extent from the A34 and the A272/A31.

11.3.2 This situation is best illustrated by Defra's Round 2 noise maps, which depict the $L_{Aeq,16h}$, L_{night} and L_{den} noise contours for road and rail sources. The $L_{Aeq,16h}$ daytime road traffic noise contours have been reproduced in Figure 11.1.

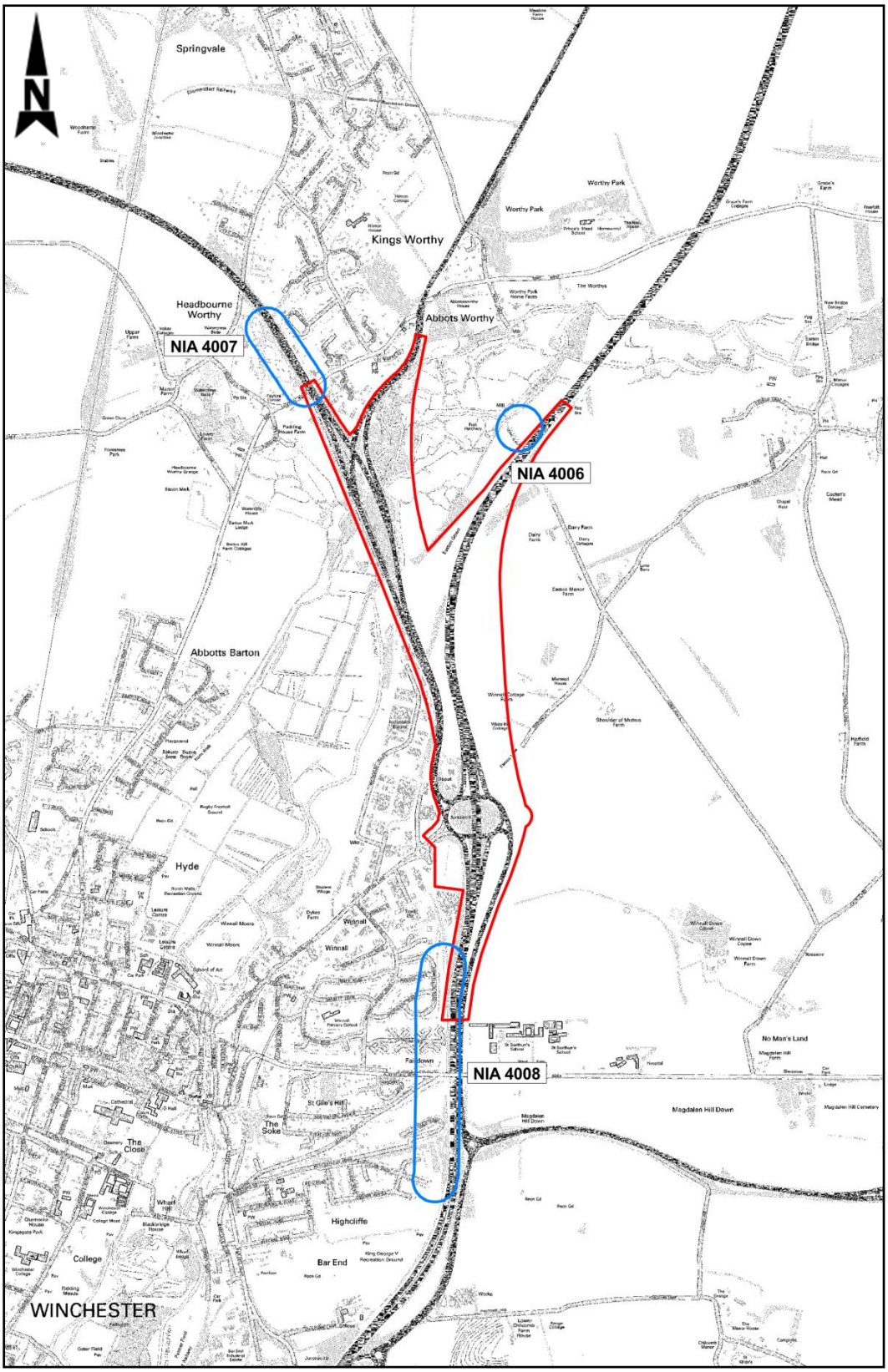
Figure 11-1: Defra $L_{Aeq,16h}$ Noise Contours



11.3.3 Three Noise Important Areas (NIAs), as identified by the Defra Round 2 noise mapping exercise, fall within the study area, as shown on Figure 11.2. Defra advises that "*Important Areas with respect to noise from major roads will be where the 1% of the population that are affected by the highest noise levels from major roads are located according to the results of the strategic noise mapping*".

[29] https://data.gov.uk/dataset/noise-action-planning-important-areas-round-2-england

Figure 11-2: Noise Important Areas



11.3.5 Not only do all three NIAs fall within the study area, they are all partially located within the scheme area as well. NIAs are identified at the following locations.

- the north-east extent of the scheme on the M3 at the northern end of Long Walk (NIA 4006)
- the north-west extent of the scheme on the A34 approximately between the underbridges at London Road (B3047) and Springvale Road (NIA 4007)
- the southern extent of the scheme south of Junction 9 and to the west of the M3, stretching to the north and south of the B3404 Alresford Road (NIA 4008)

NOISE SURVEY AND PREDICTIONS

11.3.5 Although noise maps illustrate the magnitude of the road traffic noise sources in the area, it will be necessary, in due course, to establish baseline (and future) noise levels across the area[30]. This is because the available noise contours are from a strategic noise mapping exercise, which only presents noise levels in band widths of 5 dB. The DMRB HD213/11 assessment method ultimately requires a comparison of accurate noise levels calculated to the nearest 0.1 dB.

11.3.6 Measurements or predictions can be used to establish baseline noise levels. It is expected that the noise assessment will predominantly be a predictive exercise since the circumstances of this scheme mean that road traffic noise will prevail throughout the study area now and in the future. However, in addition to helping characterise the baseline noise climate at any NSR, a noise survey could also assist in the preparation (and calibration) of the noise model. Consequently, it is anticipated that a baseline noise survey will be undertaken at PCF Stage 2. The methodology for any baseline survey will be discussed and agreed with the Environmental Health Officer (Winchester District Council) prior to commencement. The noise survey will be undertaken following guidance in BS 7445 (Description and Measurement of Environmental Noise) and the Calculation of Road Traffic Noise (CRTN). Noise monitoring will be conducted in suitable weather conditions, by appropriately qualified engineers using suitable (Class 1) sound level meters.

VALUE (SENSITIVITY) OF RESOURCE

11.3.7 Sensitive receptors are described in Section 2.3. For consideration of the potential effects of noise and vibration on flora and fauna, see Chapter 10 Nature Conservation.

11.3.8 Six notional NSRs have been identified for this initial analysis of likely effects of the scheme options, as described in Table 11-3. These receptors lie close to the junction and may be taken as representative of other NSRs nearby.

11.4 REGULATORY AND POLICY FRAMEWORK

11.4.1 Policy guidance has been drawn from the various documents described in Appendix 2.1. These documents will be used to shape the assessment of road traffic noise and vibration effects arising from the scheme. The ultimate objective of the assessment will be to determine the significance of the effects and hence the need for, and extent of, any mitigation necessary to minimise adverse effects.

[30] The HD213/11 assessment methodology defines the baseline year as the opening year of the road scheme. The future assessment year for operation is typically the 15th year after the opening of the road scheme, but in some circumstances may occur before the 15th year.

11.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

CONSTRUCTION

11.5.1 The noise and vibration effects arising during construction can be mitigated to an extent through contractual means. Contract conditions can be used to limit noise from a construction site, to control working hours (especially for potentially disruptive operations), to prevent access to sensitive areas, and to restrict construction traffic to suitable haul routes, etc. It is important that contractual working restraints are discussed in advance with the Environmental Health Officer (Winchester District Council). Monitoring of noise and vibration may be required during construction.

11.5.2 The CoPA Section 61 sets out procedures for those undertaking works to obtain 'prior consent' for construction works. Applications for such consent are made to the relevant local authority and contain a method statement for the works and the steps to be taken to minimise noise and vibration. Under Section 60 of CoPA, the local authority has powers to serve a notice imposing requirements as to the way in which the works are to be carried out and may specify plant or machinery which is (or is not) to be used, the hours during which the works may be carried out and the level of noise or vibration which may be emitted at any specified point. Although it is generally for those undertaking the works to decide whether or not to seek a Section 61 consent, this is also dependent on the custom and practice of the local authority. Some local authorities request demonstration of Best Practicable Means (BPM) rather than a formal 'prior consent' application.

11.5.3 In considering possible methods of mitigating adverse effects during the construction period, it will be necessary to balance the severity of an effect and its duration. For example, it may be acceptable if greater disruption occurs over a short period, than lesser disruption over an extended period.

11.5.4 It will be important to manage and control noise and vibration throughout the construction period and to this end a mitigation strategy will be developed at a later stage in the design process, once information is available regarding how the option(s) might be constructed. It is anticipated that this mitigation strategy would be formalised within a CEMP developed by the Principal Contractor in liaison with Winchester District Council. The CEMP would include, but not necessarily be limited to, the following:

- environmental management responsibilities and activities
- monitoring and auditing processes
- complaints handling and response procedures
- community and stakeholder liaison processes

11.5.5 During the construction phase, it is recommended that the all contractors should apply BPM to minimise any residual noise impact. Some general methods of noise control are included in Appendix 11.2. The risk of significant construction noise and vibration effects will be minimised by appropriate measures in the CEMP, which will be applied throughout the construction phase.

OPERATION

11.5.6 A number of measures are available, which can be applied either in isolation or in combination, to mitigate the adverse effects of road traffic noise. Some scheme-related measures are set out below.

- *horizontal alignment* – moving a route away from sensitive receptors

- *vertical alignment* – keeping a route low within the natural topography can exploit natural screening
- *environmental barriers* – in the form of earth mounding or acoustic fencing of various types, or a combination of the two
- *low noise road surface* – most effective for noise generated by tyres of vehicles travelling at speeds in excess of 75 kph (c47 mph)
- *speed and volume restrictions* – above about 40 kph, noise level increases with the speed of the vehicle; the volume and composition of traffic also have a direct effect on noise levels

11.5.7 These measures are considered further in Appendix 11.3.

11.6 OVERALL ASSESSMENT

11.6.1 The potential effects from the scheme can be divided into two main categories, temporary construction effects and permanent operational effects.

TEMPORARY CONSTRUCTION EFFECTS

11.6.2 Temporary noise and vibration effects can be defined as those that occur between the start of advance works and the end of the scheme construction period. Typical construction effects might include a localised increase in noise and/or vibration and a loss of amenity due to the presence of construction traffic.

11.6.3 The following are generally applicable to temporary construction related effects:

- the area where construction disrupts tends to be more localised than the effects of the road scheme once it has opened to traffic
- the duration of the effects is important when considering the potential for disturbance
- it has been shown that disturbance arising from construction diminishes rapidly with distance

11.6.4 In addition to the effects arising from the construction of the road itself, disruption can occur during advance works, for example to divert utilities, and these works may extend beyond the immediate construction site. Where materials need to be transported to or from the site, the effects of the additional traffic along access routes would require consideration, where data are available.

11.6.5 Some options more than others, may require the use of temporary diversion routes and so receptors in proximity to such routes may experience increased levels of noise and maybe vibration too. Furthermore, where works occur in the vicinity of live traffic, vehicle speeds are often restricted for safety reasons. Such decreases in speed can lead to a temporary reduction in road traffic noise level for nearby receptors.

11.6.6 Certain activities and operations are more likely than others to generate potentially significant levels of noise and vibration (for example, piling, or large scale earthworks). Hence, these should be identified at the earliest opportunity, along with the likelihood of any night-working, as all these aspects can increase the chance of disturbance. Given the nature of the area in which M3 Junction 9 is situated and the construction of the various highway links that might form the junction, all the highway options are likely to involve at least one substantial structure, such as an underpass or overbridge.

11.6.7 The following tables provide an indication of the nature and extent of the works for each scheme option by outlining the number and length of new links and slip roads and the requirement for underpasses and overbridges. All else remaining equal, it would be reasonable to assume that the greater the physical extent of the works, the greater would be the potential for noise and/or vibration disturbance during construction.

Table 11-1: Schedule of new and widened roads and sections to be removed

ACTIVITY	LINK, SLIP OR SECTION OF ROAD	OPTION				
		11	14	16A	16B	18
Construction	Widened A34 (*over the northbound A33*)	✓				
	New A34 southbound link to M3/J9 (*under the existing M3 and the new M3 northbound on-slip from J9*)	✓	✓			
	New A34 southbound link to M3/J9 (*under the existing M3*)			✓		
	New A34 southbound link to J9 (*under the new M3 northbound link to A34*)				✓	
	New M3 northbound on-slip from J9 (*under the new M3 northbound link to A34 and over the new A34 southbound link to M3/J9*)	✓	✓			
	New M3 northbound link to A34 (*over the new M3 northbound on-slip*)	✓	✓			
	New M3 northbound link to A34 (*over the new A34 southbound link to J9*)				✓	
	New M3 southbound off-slip	✓	✓	✓		
	New dumbbell junction (*over the M3*) with associated slip roads	✓	✓	✓		
	New through-about at J9 (*over the existing M3*)					✓
Demolition/ Removal	Existing J9 gyratory	✓	✓	✓		
	Existing M3 southbound off-slip	✓	✓	✓		
	Existing M3 northbound on-slip	✓	✓		✓	

Table 11-2: Approximate Length of New and Realigned Roads, Links and Slips under each Option

	OPTION				
	11	**14**	**16A**	**16B**	**18**
Length of new and realigned roads, links and slips	8,200m	6,900m	5,050m	2,650m	1,200m
(length as a percentage relative to option 11)	-	*(84%)*	*(61%)*	*(32%)*	*(15%)*
Length of new and realigned roads, links and slips, excluding the realignments associated with the northbound diverge of the A33 from the A34 (present for all options other than 11)	8,200m	5,950m	4,100m	1,700m	250m
(length as a percentage relative to option 11)	-	*(72%)*	*(50%)*	*(21%)*	*(3%)*

Note: All distances rounded to the nearest 50m

11.6.8 Option 11 is the most extensive in terms of the number and length of new and realigned roads and associated structures, whilst Option 18 is the least. However, it does not necessarily follow that significant adverse effects will occur under any of the options; this will depend, amongst other things, on the number and proximity of NSRs, the timing and duration of works and how all construction and demolition processes are managed.

11.6.9 Considering the plans illustrating each scheme option (Figure 3.1 to Figure 3.5) it can be seen that there are few, if any, NSRs close to the main focus of activity. Therefore, any construction related effects would likely be limited, in the main, to those NSRs located close to areas where existing roads join new alignments (i.e. at the periphery of the junction, rather than at its heart).

11.6.10 Despite the lack of information at this time that precludes any quantitative assessment, the proximity of certain sensitive receptors to M3 Junction 9, allied to the scale and complexity of the works and associated construction traffic and traffic management, means that the potential for disruption during the construction phase cannot be discounted, whichever option is constructed. This conclusion would be strengthened should any night-working be required.

11.6.11 Although construction-related effects are temporary, they may nevertheless be sufficient to require mitigation and consideration was given to specific measures that might be employed in the preceding section. As construction effects are temporary and can be controlled to an extent through implementation of appropriate environmental management plans, construction noise and vibration effects may ultimately not be a significant differentiator in the decision-making process to select a preferred scheme option.

PERMANENT OPERATIONAL EFFECTS

11.6.12 The level of road traffic noise affecting any receptor is dependent on a number of variables, all of which are accounted for within the CRTN prediction methodology. In summary these are:

- traffic related factors: number, speed and composition of vehicles;
- road related factors: surface (e.g. concrete or bituminous) and gradient;
- propagation factors: distance, the presence screening and type of ground cover intervening between the road and any receptor; and
- receptor specific factors: view of the road and reflections.

11.6.13 Therefore, should any of these factors vary, whether that is through changes on, or to, an existing road, or through the introduction of a completely new section of road, then noise levels are also likely to change. Collectively, these variables might cause noise levels to increase or decrease at any particular receptor.

11.6.14 The primary transportation objective for altering M3 Junction 9 is to improve traffic flow and ease severe congestion which affects the junction at certain times. Therefore, it can be expected that average traffic speeds post scheme opening might increase in the vicinity of the junction. All else remaining equal, above approximately 40 kph (25 mph) traffic noise will increase with increasing speed. With less congestion and an improved flow through the junction, traffic might also be drawn to the area, rather than discouraged as at present. A higher volume of traffic will also generate more noise, all else remaining equal.

11.6.15 On this basis and considering specific links in isolation, traffic noise levels might be expected to increase and possibly by a significant amount. Of course, there may be other receptors where traffic noise levels reduce, perhaps because mitigation (for example, in the form of a low noise road surface and/or noise barriers) has been introduced.

11.6.16 It has already been noted that the junction improvement works might introduce new sections of road and that there would be relatively few dwellings in close proximity to such roads. However, the improvement works might also alter the alignment of existing roads as well as the volume, speed and composition of traffic and there are relatively more dwellings located close to those areas where existing roads might link to any new alignments. Therefore, notwithstanding the lack of information that precludes any quantitative assessment at this time, it can be concluded that there is potential for significant operational traffic noise effects to arise, although implementing mitigation would provide some amelioration.

11.6.17 This conclusion is strengthened by the information contained in the following tables. Table 11-3 identifies six representative NSRs and the distance separating them from the nearest part of the existing junction. Where the distance between any new or realigned section of road would be less than existing, this is shown by the shaded cells on the right hand side of the table.

Table 11-3: Separation distance between NSRs and the nearest road link forming part of Junction 9

NOISE SENSITIVE RECEPTOR (NSR)	OS GRID REFERENCE	EXISTING SCENARIO	FUTURE SCENARIO – OPTION				
			11	14	16A	16B	18
White Hill Cottage, Easton Lane	449850, 130885	**180m** M3 southbound off slip	**80m** [1]	**115m** [1]	**115m** [1]		
1-39 Dennett House, Winnall Manor Road	449525, 130040	**125m** M3 northbound south of J9					
Dairy Cottages, Fulling Mill Lane	450068, 131615	**345m** M3 southbound north of J9	**320m** [1]				
Pudding House Farm, Pudding Lane	448948, 132030	**160m** A34 northbound north of J9					
Meadow Cottage, London Road	449012, 132206	**25m** A34 northbound north of J9					
20/21 Church Green Close, Kings Worthy	449225, 132184	**35m** A33 northbound north of J9					

Notes: [1] = M3 southbound off-slip.
Distances rounded to the nearest 5m (distance from NSR to the centre of nearest road)

11.6.18 Table 11-4 describes the alignment changes relative to the nearest NSRs. This table considers propagation effects only. It has already been noted that changes in traffic data (flow, speed and composition) arising from the scheme could influence noise levels, but these cannot be assessed at present, due to a lack of data.

Table 11-4: Description of proposed junction improvement work in relation to the nearest NSRs

NSRs AT/TO	OPTIONS				
	11	14	16A	16B	18
J9	A new dumbbell junction is to be formed within the existing gyratory with new or altered slip roads linking to existing roads. There are no NSRs close to the J9 so only limited operational effects are considered likely.			No alignment change to the existing gyratory although work on the proposed M3 northbound link to the A34 commences towards the centre of the junction.	A new link is proposed through the existing gyratory to provide a dedicated link from the A34 southbound to the M3 southbound Some associated (minor) widening is also proposed to the west of the gyratory.
East	Both the realigned M3 southbound off-slip and the new A34 southbound link to J9 bring traffic closer to White Hill Cottage. These roads are aligned further east under Option 11, than Option 14 or 16A. Although both these roads lie in cutting for some of their length (and so would benefit to an extent from screening), they sit on embankment as they pass west of White Hill Cottage. Consequently, it is at this NSR and others nearby, that there is the greatest potential for significant adverse effects. Nevertheless, although these roads will carry less traffic than the M3 itself (which is the dominant source of road traffic noise in the area) it is likely that consideration will need to be given to additional mitigation measures.			No alignment changes are proposed to the east of the existing M3.	
South	The realigned M3 southbound on-slip stretches some 450m south of the existing gyratory (a little further south than the southern extent of the Tesco store located to the west of the M3). However, this is no further south than the existing slip road merge with the M3. The nearest NSRs to the south-east are set-back from the M3 and screened to an extent. St Swithun's School is located 300m south of the furthest extent of works. Consequently, it is considered unlikely that any NSRs to the south of J9 would experience significant adverse effects as a result of the new or altered highway alignments.			Works commence in the centre of the existing gyratory.	No alignment changes are proposed to the south of the existing gyratory.
West	The proposed works do not bring the M3, A34 or A33 any closer to NSRs to the west. Traffic heading north from the M3 to the A34 would take a slightly more easterly alignment, so some very limited benefits might arise at NSRs to the west, although the nearest are located some distance away.		No alignment changes are proposed to the west of the existing road alignments.	The proposed works do not bring the M3, A34 or A33 any closer to NSRs to the west. Traffic heading north from the M3 to the A34 would take a slightly more easterly alignment, so some very limited benefits might arise at NSRs to the west, although the nearest are some distance away.	No alignment changes are proposed to the west of the existing road alignments.

NSRs AT/TO	OPTIONS				
	11	14	16A	16B	18
North	At their furthest, the works extend just north of London Road, although realignments in this area are limited. A little further to the south the existing bridge carrying the southbound A34 over the northbound A33 will need to be widened, but operationally any realignments would be limited in extent and most NSRs would be at least 200m away.	At their furthest extent, the works do not extend beyond the River Itchen, although there would be some minor realignments associated with the northbound diverge of the A33 from the A34.			No alignment changes are proposed to the north of the existing gyratory, although there would be some minor realignments associated with the northbound diverge of the A33 from the A34.
Abbreviations: NSR = noise sensitive receptor; J9 = M3 Junction 9.					

11.6.19 On balance, and as noted above, the likelihood of significant operational noise effects arising from any of the options cannot be discounted at this time. It is also reasonable at this stage to assume that the potential for such effects would be greatest for Option 11 (the option with most extensive changes) and least for Option 18 (the option with the least extensive changes). For the remaining options, 14 and 16A, with their more easterly alignment, would have greater potential to cause adverse noise effects than Option 16B. This is because the new links forming Options 14 and 16A take a more easterly line, bringing traffic closer to sensitive receptors located off Easton Lane, compared with Option 16B where the majority of works are contained within the narrow corridor formed by the existing M3 and A34.

11.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

11.7.1 The lack of information including, in particular, traffic data, has dictated that only a broad and qualitative assessment can be undertaken at this stage. In due course, when road traffic data become available and alignments are refined, a proportionate assessment of temporary and permanent noise and vibration effects will be undertaken following the guidance contained in the DMRB, WebTAG and Noise Insulation Regulations 1975.

11.8 SUMMARY

11.8.1 This chapter provides an assessment of the potential noise and vibration effects arising from the construction and operation of the proposed junction improvements on nearby NSRs. The information available at PCF Stage 1 is limited and therefore the findings should be considered preliminary, with the primary objective being to support the option identification process.

11.8.2 Despite the lack of information that precludes any quantitative assessment, the proximity of certain NSRs to M3 Junction 9 and the scale and complexity of the works and associated construction traffic and traffic management, the potential for noise and vibration disruption during the construction phase cannot be discounted at this time, whichever option is constructed. This conclusion would be strengthened should any night-working be required. The risk of significant construction noise and vibration effects on NSRs will be minimised by appropriate measures in the CEMP, which will be applied throughout the construction phase.

11.8.3 Post construction, all the scheme options have some potential to affect the noise and vibration levels experienced at nearby NSR's due to changes in the road layout and operation of the junction, along with associated changes in vehicle numbers, mix and speed. However the possibility that any significant adverse effects could be mitigated through the implementation of appropriate measures means that operational effects may ultimately not be a significant differentiator in the decision-making process to select a preferred scheme option.

11.8.4 While there is potential for significant operational noise and vibration effects associated with all of the options. It is reasonable to assume that the potential for such effects would be greatest for Option 11 (the option with the most extensive changes and potential for varying traffic flows) and least for Option 18 (the option with the least extensive changes). Of those remaining, Options 14 and 16A would have greater potential to cause adverse noise and vibration effects compared to Option 16B. This is because the new links forming Options 14 and 16A take a more easterly line, bringing traffic closer to sensitive receptors located off Easton Lane, compared with Option 16B where the majority of works are contained within the narrow corridor formed by the existing M3 and A34.

11.8.5 The preliminary overall ranking for noise and vibration would be Option 11, 14, 16A, 16B and 18, with Option 11 having the greatest potential to cause adverse effects and Option 18 the least.

12 PEOPLE AND COMMUNITIES

12.1 INTRODUCTION

12.1.1 This assessment follows the updated DMRB topic structure contained within IAN 125/15. This combines published guidance in DMRB Volume 11, Section 3, Parts 6 (Land Use), 8 (Pedestrians, Cyclists, Equestrians and Community Effects) and 9 (Vehicle Travellers) into one assessment of People and Communities.

12.1.2 The assessment considers any impacts that the scheme may have on:

- Effects on All Travellers: Motorised Travellers (MT) which are defined as drivers and passengers of both public and private vehicles, and Non-Motorised Users (NMU) which are defined as pedestrians, cyclists and equestrians, including amenity and journey length
- Effects on Communities and Private Assets, including development land, agricultural land, private and community land, community severance, tourism and recreation, and housing
- Effects on People: including local economy, employment, health and population

12.1.3 The ESR provides a high level assessment of the potential for the proposed options to effect existing travel patterns, journey lengths and communities within the study area. Road safety and effects on severance have also been considered at the local level.

12.2 ASSESSMENT METHODOLOGY

EFFECTS ON ALL TRAVELLERS

MOTORISED TRAVELLERS: VIEW FROM THE ROAD

12.2.1 The DMRB Volume 11, Section 3, Part 9 describes the “View from the Road” as “the extent to which travellers, including drivers, are exposed to the different types of scenery through which a route passes”.

12.2.2 Views from the road have been categorised by the criteria in DMRB Volume 11, Section 3, Part 9.

MOTORISED TRAVELLERS: DRIVER STRESS

12.2.3 Driver Stress is defined in Volume 11 of the DMRB as the adverse mental and psychological effects experienced by a driver traversing a road network. Stress can induce a driver’s feelings of discomfort, annoyance, frustration, or fear culminating in physical or emotional tension that detracts from the value and safety of the journey.

12.2.4 The level of Driver Stress has been assessed qualitatively. The assessment has used the DMRB three point descriptive scale for the impacts, namely Low, Moderate or High.

NON-MOTORISED USERS

12.2.5 The methodology has been based on the procedures set out in the DMRB Volume 11, Section 3, Part 8 and 9 and the application of DMRB Volume 5, Section 2, Part 5, HD42/05, and has considered:

- The impact of the scheme on the journeys that NMUs make in its locality
- The impact on existing usage of the community facilities and routes by pedestrians and others

- Changes in safety and amenity value of routes which may be affected by the scheme route
- The effects of the junction options on community severance

12.2.6 The assessment involved a desk study to identify likely NMU activity, as well as how local community facilities are likely to be affected by the construction and operation of the proposed options and the potential adverse and beneficial effects.

12.2.7 The level of new severance has used the criteria in DMRB Volume 11, Section 3, Part 8 which categorises severance as Slight, Moderate or Severe.

EFFECTS ON COMMUNITIES AND PEOPLE

12.2.8 The effects have been assessed qualitatively within this ESR based on professional judgement and have been undertaken in the absence of specific guidance of potential effects on communities. Desk based research has been undertaken which includes a review of publically available data.

12.2.9 An Equality Impact Assessment (EqIA) screening has been completed by Highways England using the Equality, Diversity and Inclusion sifting Tool (EDIT) (HE551511-WSP-GEN-M3J9PCF1-RE-PM-EQIA04). This concluded that an EqIA should be considered; however, at the current stage the scheme is not sufficiently developed to fully assess the impact on the different groups of people. The EDIT and EqIA will be considered further during PCF Stage 2.

12.3 BASELINE CONDITIONS

EFFECTS ON ALL TRAVELLERS

MOTORISED TRAVELLERS: VIEWS FROM THE ROAD

12.3.1 From the northern extent of the scheme on the A34 the views from the road are as follows:

- On approach to the merge with the southbound A33, the road is broadly level with the surrounding land, with views of roadside vegetation and a wooded area. There are some intermittent views of agricultural land; and
- On approach to M3 J9, there are views of an industrial estate to the west.

12.3.2 From the northern extent of the scheme on the M3 the view from the road are as follows:

- The carriageway is below the level of the surrounding land, with views of roadside vegetation on the verges
- On the southbound approach to the exit slip for M3 J9, there are views of woodland on either side of the carriageway
- The exit slip road climbs to the grade separated junction, with intermittent view of agricultural land to the east
- Southbound along the M3 through M3 J9, the carriageway is in a cutting with views of roadside vegetation and wooded areas on either side of the carriageway. Towards the south of the junction there are again views of woods and roadside vegetation on either side

12.3.3 From the eastern extent of the scheme on the A272 Spitfire Link the views form the road are as follows:

- A272 Spitfire Link joins M3 J9 via a steady incline from the south, and is predominately screened by trees

12.3.4 In general, the views from the road for MT on the surrounding road network provide a positive experience.

MOTORISED TRAVELLERS: DRIVER STRESS

12.3.5 Hampshire County Council commissioned the 'M3 Junction 9 Feasibility Study – Initial Options Summary Report (Atkins, November 2013)' to consider junction options at this location. The report highlights that during the morning peak hour a total of 4,720 vehicles were using the A34 Winchester bypass at M3 J9. The traffic flow profile demonstrated that the A34 southbound approach had the highest demand and that the majority of traffic originating from the A34 ultimately joined the M3 in a southbound direction.

12.3.6 The report also commented on average levels of delay. It indicated that the observed delays were in excess of 5 minutes on the A272 Spitfire Link approach to the junction, and approximately 40 seconds on the Easton lane, A34 southbound and M3 J9 southbound off-slip approaches. Data were not available for the M3 J9 northbound off-slip approach.

12.3.7 In addition, recent site observations have identified significant queuing on the M3 northbound off-slip, with vehicles blocking upstream onto the M3 mainline, causing significant road safety concerns which is likely to have a significant effect on Driver Stress.

12.3.8 Although it is not possible to assess route uncertainty, it is considered that due to the level of fear and frustration experienced by MTs, the level of Driver Stress currently experienced is High.

NON-MOTORISED USERS: AMENITY AND JOURNEY STRESS

12.3.9 No NMU facilities are provided on the M3 mainline or slip roads. There are a number of NMU routes through M3 J9 via subways.

OPTION 11

12.3.10 The following PRoW are considered in the assessment of Option 11:

- Bridleway 502 would be crossed by the route
- Footpath 749 would be crossed by the route
- Footpath 6 would be crossed by the route
- Existing NMU route through M3 J9 would be replaced

OPTION 14

12.3.11 The following PRoW are considered in the assessment of Option 14:

- Bridleway 502 would be crossed by the route
- Existing NMU route through M3 J9 would be replaced

OPTION 16A

12.3.12 The following PRoW are considered in the assessment of Option 16A:

- Bridleway 502 would be crossed by the route
- Existing NMU route through M3 J9 would be replaced

OPTION 16B

12.3.13 The following PRoW are considered in the assessment of Option 16B:

- Bridleway 502 would be crossed by the route
- Existing NMU route through M3 J9 would be replaced

OPTION 18

12.3.14 The following PRoW are considered in the assessment of Option 18:

- Bridleway 502 would be crossed by the route
- Existing NMU route through M3 J9 would be replaced

12.3.15 The PRoWs which are affected are outside the built up areas of Winchester and are set within agricultural land, and as such are likely to be used primarily for recreational purposes.

EFFECTS ON COMMUNITIES

COMMUNITY SEVERANCE

12.3.16 Community Severance is defined as the separation of residents from facilities and services that they use within their community caused by new or improved roads or by changes in traffic flow.

12.3.17 The scheme options are located on the outskirts of Winchester. The nearest communities outside of Winchester are Kings Worthy, Headbourne Worthy and Abbots Worthy, all located to the north of Winchester.

12.3.18 It is considered likely that the majority of journeys made between these communities in order to access facilities will be made by motor vehicle.

WINCHESTER

12.3.19 Winchester is a historic city and provides a vast range of services including a hospital, a university and a large number of retail outlets, and is a large local centre.

12.3.20 A large proportion of journeys to and from Winchester to access the above services will be via the A34 and M3.

KINGS WORTHY, HEADBOURNE WORTHY AND ABBOTS WORTHY

12.3.21 These three local settlements all provide minimal community services and therefore residents are likely to access these within Winchester, and will primarily travel to Winchester via either the A33 which links directly to the A34, and therefore is not a suitable pedestrian access route, or via the B3047 which also provides minimal provision for pedestrians.

EFFECTS ON COMMUNITIES: TOURISM AND RECREATION

12.3.22 M3 J9 provides a direct gateway to the south coast including the cross-channel and Isle of Wight ferry ports at Portsmouth, the Isle of Wight ferry ports and cruise ports at Southampton, the New Forest National Park, and westward towards Poole and Bournemouth from the north via the A34 and from M25 connections, London and Basingstoke via the M3. M3 J9 also provides direct access to Winchester, a historic city which provides a range of tourist attractions.

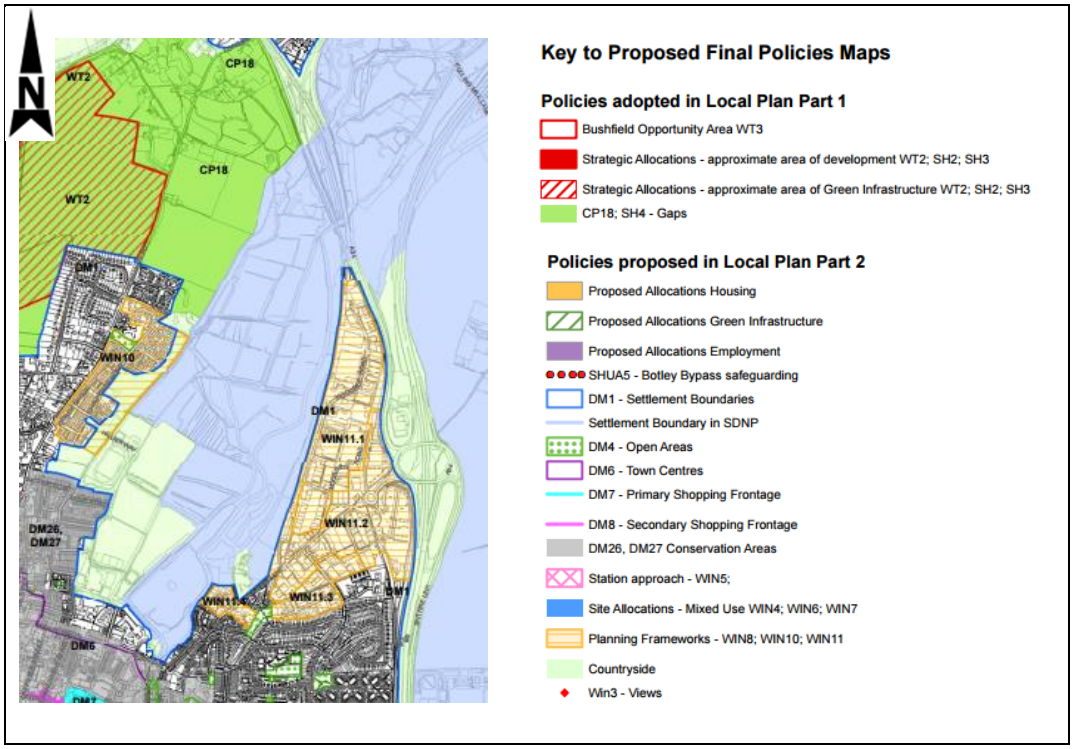
COMMUNITY LAND

12.3.23 No land registered under the CRoW Act has been identified within the study area.

DEVELOPMENT LAND

12.3.24 Winchester City Council (WCC) is currently in the process of submitting its Local Plan. WCC has allocated the space located immediately adjacent to the scheme area as a Gap (CP18) and the large parcel of land located directly west of the M3 J9 roundabout as part of its Winall Planning Framework (WIN11.1, WIN11.2, WIN11.3 and WIN11.4) as can be seen in Figure 12.1 below.

Figure 12-1: Map 26 - Winchester East (Winchester City Council Policies Map)



12.3.25 As of June 2016 there are no planning applications currently under consideration within the immediate vicinity of the scheme in the SDNP Authority according to the SDNP's website (http://planningpublicaccess.southdowns.gov.uk/online-applications/spatialDisplay.do?action=display&searchType=Application).

DEMOLITION OF PRIVATE PROPERTY

12.3.26 Residential receptors are described in section 2.3. None of the options require the acquisition or demolition of private property and so private property is not considered further within this chapter.

AGRICULTURAL LAND

12.3.27 Agricultural land has been classified by the Ministry for Agriculture, Fisheries and Food (MAFF), now DEFRA, by grade according to the extent to which chemical and physical characteristics of the land impose long term limitations on its agricultural use for food production. In accordance with DMRB guidance, only land potentially falling within Agricultural Land Classification (ALC) grades 1, 2 and 3a are considered to be 'Best and Most Versatile' (BMV). BMV land is best suited to adapting to the changing needs of agriculture and maintaining the competiveness of UK agriculture against international competitors.

12.3.28 The Regional ALC maps, upon which the assessment is based, were created from surveys undertaken by MAFF between 1989 and 1999, and should therefore be treated with some caution in the absence of detailed site investigation survey results. Grades 3a and 3b are not

distinguished between on these maps.

12.3.29 The Regional ALC map for the site location (ALC007) indicates that the land to be considered for the scheme options is a mixture of Grade 3 (Good to Moderate) and Grade 4 (Poor). Further investigation will be required, to identify exactly the quantities of each grade present at PCF Stage 2.

EMPLOYMENT

12.3.30 Employment statistics for the Winchester District have been obtained from the Office of National Statistics (ONS) and provide information on the percentage of the population currently employed (thus providing an indication of the local economy). These percentages are shown in comparison to the South East as a whole, and England as a whole. The information is presented below in Table 12-1.

Table 12-1: Employment statistics

EMPLOYMENT STATUS	WINCHESTER DISTRICT	SOUTH EAST	ENGLAND
Employed	73.8%	74.9%	71.6%
Long Term Unemployed	0.4%	0.6%	1.0%
Never Worked	1.0%	1.6%	2.7%
Full Time Student	9.0%	6.7%	7.0%
Unclassified	15.8%	16.2%	17.7%

Source: Office of National Statistics

12.3.31 The data indicates that in comparison to England as a whole, a greater percentage of the population of Winchester are in employment. This is slightly lower than compared to the South East. A lower percentage of the population of Winchester is either classed long term unemployed or as having never worked, compared to either the South East or England as whole. The above statistics suggest that the local economy is prosperous, with good employment prospects for its residents.

12.4 REGULATORY AND POLICY FRAMEWORK

12.4.1 The regulatory and policy framework in relation to people and communities which are considered relevant to the scheme are detailed in Appendix 2.1.

12.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

EFFECT ON ALL TRAVELLERS

MOTORISED TRAVELLERS

12.5.1 The preferred design solution should improve the experience of MT using the route and connecting roads. The following mitigation and enhancement measures will contribute to an improved experience for MT:

- → Where overriding landscape or design constraints do not restrict this, the views from the road for MT should not be further obscured by new structures(s), and open views of the surrounding countryside should be retained

- The delays currently expressed by MT using both M3 J9 and its connecting roads are expected to lead to frustration, and should be reduced. The best performing options will result in a reduction in Driver Stress associated with delays
- Signage and layout should be clear to understand and avoid creating Route Uncertainty. Any diversions or closures undertaken during construction should be clearly advertised, and any diversionary routes should not lead to Uncertainty
- The design should include safety measures to reduce Fear of Accidents

12.5.2 These issues should be addressed at the subsequent phase of design.

NON-MOTORISED USERS

12.5.3 The preferred design solution should accommodate NMU and either retain or improve the existing access arrangements. For example, the existing footpaths should be retained and where crossed by the route, provided with a proper means of access to prevent severance. Any diversionary works or closure of NMU routes should be undertaken following proper consultation with affected groups or individuals, and the required consent orders obtained.

12.5.4 Use of best practice design with regards to the safety of NMU, including lighting, will improve the amenity of users of the footpaths in the surrounding areas. Additionally, landscaping that can provide screening of the road where possible and reduce noise levels for the wider network of PRoW will also improve amenity of users.

12.5.5 Existing types of access to PRoW should be retained, for example, by not introducing new barriers such as stiles, which may restrict certain users. Where access cannot be retained, replacement or alternative routes should be provided.

EFFECT ON COMMUNITIES

COMMUNITY SEVERANCE

12.5.6 Existing footpaths should be retained and where crossed by the route, provided with proper means of access to prevent severance. Existing roads should be incorporated in the scheme, allowing for crossing points within the design.

TOURISM AND RECREATION

12.5.7 Use of best practice construction methods during construction will reduce disruption to users of facilities within the vicinity of the scheme.

COMMUNITY LAND

12.5.8 Land registered as Common Land will need to de-registered and may require replacement land to be provided in exchange for the land lost.

DEVELOPMENT LAND

12.5.9 Consideration should be given within the design to accommodate any planned developments that are affected by the design.

AGRICULTURAL LAND

12.5.10 If a significant area of BMV agricultural land will be required to enable development of a scheme option, there may be a need to undertake an Agricultural Impact Assessment, This should consider the impact of the preferred option on the existing agricultural business affected by the loss, and the future viability of any land which is severed by development. The Agricultural Impact Assessment will be undertaken The Agricultural Impact Assessment will be undertaken in conjunction with a consultation with DEFRA and the affected land owners.

12.5.11 Although agricultural land required within the footprint of the route will be lost permanently, the following measures can be implemented during construction;

- Agricultural land take – Ensure the scheme involves the permanent land take of the minimum amount of land take necessary
- Severance during construction to be minimised through careful siting of construction compounds and lay down area, and careful planning of construction activities through consultation with landowners
- Crop Loss and timing impacts – crop loss can be reduced by giving advanced warnings to enable farmers to plan ahead
- Consideration of field drainage impacts during the design phase
- Noise and dust to be kept to a minimum and within acceptable working limits, using best practices methods

EFFECTS ON PEOPLE

ECONOMY

12.5.12 Where possible, the workforce and project supply chain should be locally sourced.

SOCIAL PROFILE

12.5.13 The design should take account of vulnerable groups such as the disabled, children and elderly people.

HEALTH PROFILE

12.5.14 Best practice construction methods should be used to minimise noise and emissions to air during construction.

12.5.15 PRoW should remain open where possible and diverted if possible, instead of closures, to allow active travel and recreational use by residents.

12.6 OVERALL ASSESSMENT

12.6.1 The impacts in relation to People and Communities of the five options under consideration are summarised in Table 12-2.

Table 12-2: Option impact summary table

OPTION	ALL TRAVELLERS	COMMUNITIES	PEOPLE
Option 11	→ The alignment alterations at M3 Junction 9 will have a restricted view with frequent cuttings. → Driver stress may be temporarily adversely affected by construction works and be considered moderate, but will be reduced to low in the locality of the new layout as the traffic flows will be improved. There may a slight increase in stress (to medium) whilst regular users acclimatise to the new layout, but this is likely to be very short term. → NMU amenity will be affected on Bridleway 502, Footpath 749, Footpath 6 during construction, and these will require suitable diversions and/or new crossing points in order to prevent significant changes in journey time or journey length. → It would have minimal effect on journey length for MTs.	→ This option does not have the potential to sever communities. → It will not directly affect any tourism or recreational facilities nor adversely affect future housing development. → It does not require the demolition of any existing housing, → Community and private assets will not be affected.	→ This option will provide a beneficial effect on commuter journeys through the junction and is likely to improve commuter journeys in and out of Winchester. → It is not likely there will be any direct impacts on the areas of strategic growth and employment land allocations within Winchester. → It will have a beneficial effect on traffic flow on the A34. → It will not disproportionally affect any vulnerable groups.
Option 14	→ The alignment alterations at M3 Junction 9 will have a restricted view with frequent cuttings. → Driver stress may be temporarily adversely affected by construction works and be considered moderate, but will be reduced to low in the locality of the new layout as the traffic flows will be improved. There may a slight increase in stress (to medium) whilst regular users acclimatise to the new layout, but this is likely to be very short term. → NMU amenity will be affected on Bridleway 502 and will require a suitable diversion and/or new crossing point in order to prevent significant changes in journey time or journey length	→ This option does not have the potential to severe communities. → It will not directly affect any tourism or recreational facilities nor adversely affect future housing development. → It does not require the demolition of any existing housing, → Community and private assets will not be affected.	→ This option will provide a beneficial effect on commuter journeys through the junction and is likely to improve commuter journeys in and out of Winchester. → It is not likely there will be any direct impacts on the areas of strategic growth and employment land allocations within Winchester. → It will have a beneficial effect on traffic flow on the A34. → It will not disproportionally affect any vulnerable groups
Option 16A	→ The alignment alterations at M3 Junction 9 will have a restricted view with frequent cuttings. → Driver stress may be temporarily adversely affected by	→ This option does not have the potential to severe communities. → It will not directly affect any tourism or	→ This option will provide a beneficial effect on commuter journeys through the junction and is likely to improve commuter journeys in and out of

OPTION	ALL TRAVELLERS	COMMUNITIES	PEOPLE
	construction works and be considered moderate, but will be reduced to low in the locality of the new layout as the traffic flows will be improved. There may a slight increase in stress (to medium) whilst regular users acclimatise to the new layout, but this is likely to be very short term. → NMU amenity will be affected on Bridleway 502 and will require a suitable diversion and/or new crossing point in order to prevent significant changes in journey time or journey length	recreational facilities nor adversely affect future housing development. → It does not require the demolition of any existing housing, → Community and private assets will not be affected.	Winchester. → It is not likely to have there will be any direct impacts on the areas of strategic growth and employment land allocations within Winchester. → It will have a beneficial effect on traffic flow on the A34. → It will not disproportionally affect any vulnerable groups
Option 16B	→ The alignment alterations at M3 Junction 9 will have a restricted view with frequent cuttings. → Driver stress may be temporarily adversely affected by construction works and be considered moderate, but will be reduced to low in the locality of the new layout as the traffic flows will be improved. There may a slight increase in stress (to medium) whilst regular users acclimatise to the new layout, but this is likely to be very short term.	→ This option does not have the potential to severe communities. → It will not directly affect any tourism or recreational facilities nor adversely affect future housing development. → It does not require the demolition of any existing housing, → Community and private assets will not be affected	→ This option will provide a beneficial effect on commuter journeys through the junction and is likely to improve commuter journeys in and out of Winchester. → It is not likely to there will be any direct impacts on the areas of strategic growth and employment land allocations within Winchester. → It will have a beneficial effect on traffic flow on the A34. → It will not disproportionally affect any vulnerable groups
Option 18	→ The alignment alterations at M3 Junction 9 will provide a short section with a restricted view with frequent cuttings → Driver stress may be temporarily adversely affected by construction works and be considered moderate, but will be reduced to low in the locality of the new layout as the traffic flows will be improved. There may a slight increase in stress (to medium) whilst regular users acclimatise to the new layout, but this is likely to be very short term.	→ This option does not have the potential to severe communities. → It will not directly affect any tourism or recreational facilities nor adversely affect future housing development. → It does not require the demolition of any existing housing, → Community and private assets will not be affected	→ This option will provide a beneficial effect on commuter journeys through the junction and is likely to improve commuter journeys in and out of Winchester. → It is not likely there will be any direct impacts on the areas of strategic growth and employment land allocations within Winchester. → It will have a beneficial effect on traffic flow on the A34. → It will not disproportionally affect any vulnerable groups

12.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

12.7.1 The key issue encountered when undertaking this assessment was the absence of the modelled traffic flows to allow the quantitative comparison of the five options in relation to severance and driver stress. Once traffic data is available, a more detailed assessment of these issues will be undertaken.

12.8 SUMMARY

12.8.1 The alignment alterations will have a restricted view with frequent cuttings for Options 11, 14, 16A and 16B; and for Option 18 a short section with a restricted view with frequent cuttings.

12.8.2 For all options driver stress may be temporarily adversely affected by construction works but will reduce in the locality of the new layout as the traffic flows improve. There may a slight increase in stress whilst regular users acclimatise to the new layout, but this is likely to be very short term.

12.8.3 For all options non-motorised user amenity will potentially be affected on public rights of way during construction, and these will require suitable diversions and/or new crossing points in order to prevent significant changes in journey time or journey length.

12.8.4 None of the options are considered to have the potential to adversely affect community and private assets; tourism or recreational facilities; future housing developments; require the demolition of existing housing or cause severance.

12.8.5 All of the options are likely to have a beneficial effect on commuter journeys through the junction and on the A34 and it is not likely there will be any direct impacts on the areas of strategic growth and employment land allocations within Winchester or disproportionally affect any vulnerable groups.

12.8.6 Option 11 is likely to bring about the greatest level of disruption to People and Communities due to its magnitude in comparison to the other four options, but the overall effect of each option is likely to be minimal and as such it is difficult to differentiate between the five options in this context. Therefore, in order to rank the five options in terms of impact on People and Communities, the size of the proposed scheme has been utilised as the key determinate. The ranking for People and Communities is Option 11, 14, 16A, 16B and 18 in order of potential for the highest effect.

13 ROAD DRAINAGE AND THE WATER ENVIRONMENT

13.1 INTRODUCTION

13.1.1 This chapter provides a simple assessment of the potential effects on road drainage and the surrounding water environment caused by the construction and operation of the scheme options. The assessment of road drainage and the water environment has been undertaken in accordance with the methodology promoted within DMRB Volume 11, Section 3, Part 10 (HD 45/09).

13.1.2 This chapter includes a high level assessment of the potential impacts to groundwater bodies associated with the generation of surface-borne pollutants, such as polluted surface water runoff. This section will not cover hydrogeological impacts associated with the disturbance of contaminated land or the movement of groundwater flow. Potential impacts to groundwater resources and groundwater quality associated with these aspects are also addressed in this Chapter.

13.2 ASSESSMENT METHODOLOGY

13.2.1 The chapter provides a high-level qualitative assessment of the potential impacts of the options on the water environment within 1.5km of the scheme area. The assessment is based on the layout information that is currently available for the scheme options.

13.2.2 Once detailed design information is available at a later PCF Stage, the assessment will be updated and the method of assessment and reporting of significant effects will be undertaken based on HD 45/09 guidance. The DMRB (Volume 11, Section 3, Part 10 HD 45/09).

13.2.3 The assessment of impacts to water quality, hydromorphology, resource availability and flood risk is a predominantly qualitative assessment and does not apply the Highways England's Water Risk Assessment Tool (HAWRAT).

13.2.4 The value and sensitivity of a potential receptor is considered in terms of indicators such as quality, scale, rarity and substitutability. The assessment uses the criteria in HD 45/09.

13.2.5 The overall significance of potential impacts considers both the magnitude of the impact against the importance or sensitivity of the receptor.

13.2.6 The overall significance of an effect is also assessed with regards to the likelihood of the effect, the potential use of mitigation, and any legal obligations

13.3 BASELINE CONDITIONS

13.3.1 Baseline information has been obtained from:

- → The Highways Agency Drainage Data Management System (HADDMS)

- The Environment Agency (EA)[31]
- The BGS[32]
- The South East River Basin Management Plan
- The MAGIC geographical information portal

SURFACE WATER

13.3.2 Four of the proposed scheme options (Options 14, 16A, 16B and 18) are situated within the immediate vicinity of the River Itchen. Option 11 crosses the river in three locations, whilst the remaining options are located approximately 35m to 400m from the river. The River Itchen flows in a south-westerly direction, comprising several tributaries and land drains that flow through the River Itchen Special Area of Conservation (SAC), the River Itchen Site of Special Scientific Importance (SSSI) and the SDNP, in the northern section of the scheme area.

13.3.3 To the south of the existing Junction 9 of the M3, the River Itchen continues to flow in a south-westerly direction to discharge to the Solent approximately 22km downstream of the scheme area.

13.3.4 The scheme options are also located within the vicinity of the Nun's Walk Stream (Figure 13.1), which flows in a southerly direction approximately 250m to the west of the scheme. To the south of the scheme, the Nun's Walk Stream continues to flow in a southerly direction before it joins the River Itchen approximately 1.25km to the south-west of the scheme options.

13.3.5 The River Itchen and a number of its tributaries within the study area, including the Nun's Walk Stream, are classed as 'Main River' and are therefore under the jurisdiction of the EA. Water quality within the River Itchen and the associated tributaries classed as Main River is monitored against the objectives of the WFD. The River Itchen is assessed as having 'Good' ecological and chemical status and the Nun's Walk Stream is assessed as having 'Moderate' ecological status and 'Good' chemical status. Figure 13.2 and Figure 13.3 (Appendix A) demonstrate the current ecological and chemical status, respectively, of each of the Main Rivers monitored under the WFD within the vicinity of the scheme options.

13.3.6 There are a number of tributaries that flow into the River Itchen upstream of the scheme area. These include the Cheriton Stream, which has a 'Good' ecological and chemical status, the River Arle, which has a 'Poor' ecological status and 'Good' chemical status and the Candover Brook, which has a 'Moderate' ecological status and 'Good' chemical status.

13.3.7 The River Itchen area is subject to European and National designations, namely, the River Itchen SAC and the River Itchen SSSI. The River Itchen flows into Southampton and Solent Water SPA and Ramsar, which are located approximately 22km downstream of the scheme area. The River Itchen provides large extents of fen meadow, flood pasture and swamp habitats and is home to significant populations of nationally-rare and scarce freshwater and riparian invertebrates, is notified for otter, water vole and a number of freshwater fish species, and the assemblage of breeding birds. Information on the species present is found in Chapter 8, 'Nature Conservation'.

13.3.8 The EA's Water Abstraction Licences map indicates that there are no licensed surface water abstractions within the scheme area.

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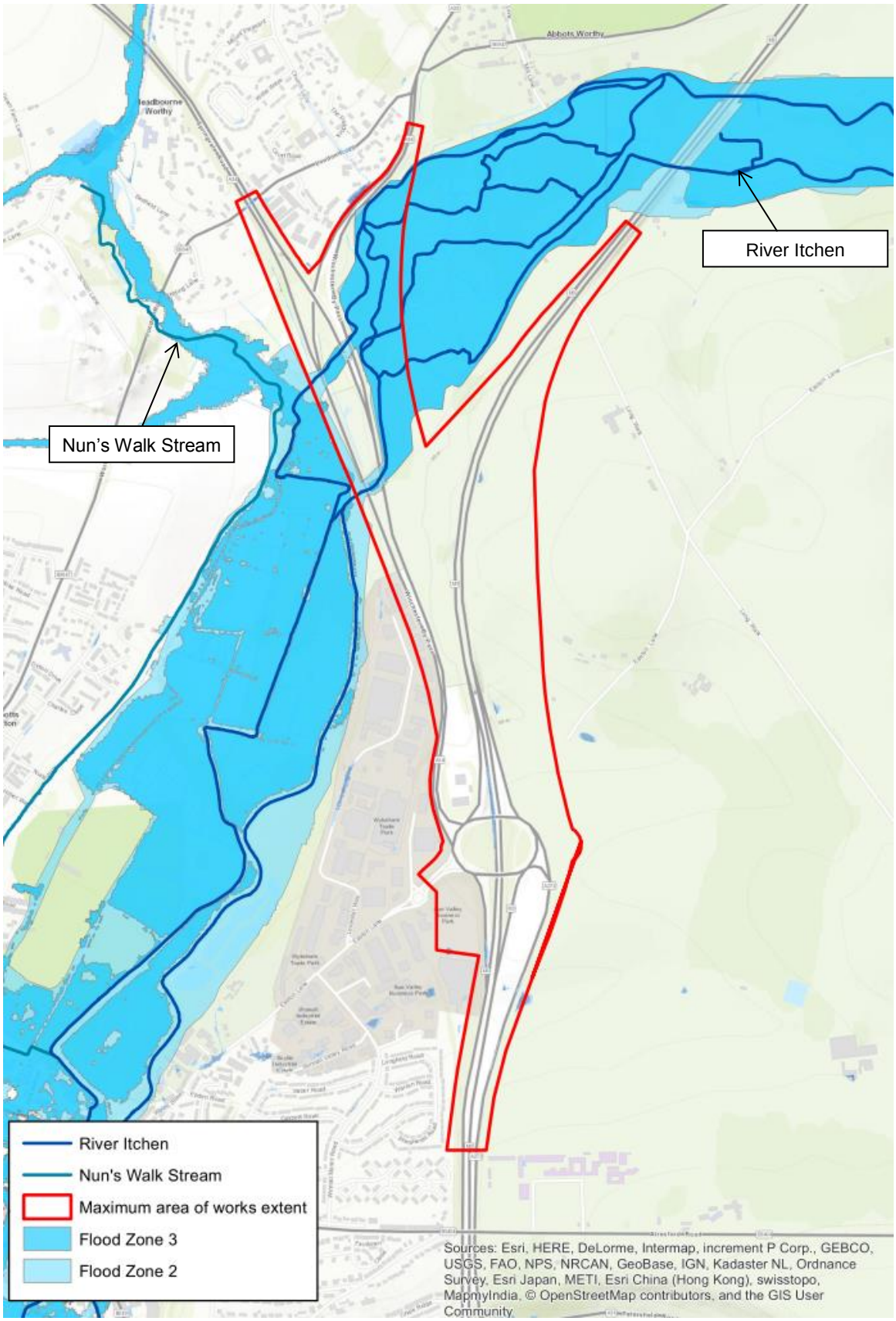
[31] EA (2016) Whats In My Back Yard [online] http://maps.environment-agency.gov.uk/wiyby/ [accessed 16 April 2016]

[32] BGS (2016) GeoViewer [online] http://mapapps.bgs.ac.uk/geologyofbritain/home.html [accessed 16 April 2016]

Figure 13-1: Flood Zones



DRAINAGE FEATURES

13.3.9 The Highways Agency Drainage Data Management System (HADDMS) identifies a number of outfalls from the Highways England network within the scheme area to the River Itchen and Nun's Walk Stream.

13.3.10 Review of HADDMS indicates that there are 15 Priority Outfalls within the study area. These are outfalls that Highways England has identified as being at risk of polluting the surface watercourses that they flow into. Two of the Priority Outfalls are designated as 'High' risk of pollution, nine as 'Moderate' risk of pollution, one as 'Low' risk of pollution and three as Risk Addressed, meaning they no longer present a pollution risk. Further details on the Priority Outfalls will be determined as part of PCF Stage 2.

13.3.11 HADDMS indicates that the existing M3 is drained via above ground continuous drainage, which is likely to comprise a number of filter drains in the verges and in the central reserve. Below ground continuous drainage channels are also indicated in the verges of the existing M3.

13.3.12 The existing A34 approach to Junction 9 is indicated to be drained via continuous above ground drainage channels within the highway verges, with a number of gullies shown. Below ground continuous drainage is indicated to be present in the central reservation, with a series of catch pits.

13.3.13 The HADDMS database shows that the existing Junction 9 Roundabout is served by above ground drainage channels on the circulatory carriageway. A number of soakaways are indicated as part of the junction highway drainage, located in the north-east and north-west areas of the junction. It is assumed that these convey surface water runoff to a below-ground drainage network. HADDMS illustrates that runoff is discharged from this network to the River Itchen and Nun's Walk Stream. Further details on the existing drainage regime will be determined as part of PCF Stage 2.

FLOOD RISK

13.3.14 The EA Flood Map for Planning (Rivers and Sea) indicates that the northern section of option 11 is within Flood Zone 3 (high risk), which equates to land assessed as having a 1% or greater Annual Exceedance Probability (AEP) of river flooding. Flood Zone 3 covers a large area between the existing A34 and M3 alignments, associated with the River Itchen and its tributaries (draining from the north-east). The northern section of option 11 is also located within Flood Zone 2 (medium risk). Flood Zone 2 is land assessed as having between 0.1% and 1% AEP for fluvial flood risk and 0.5% AEP for tidal flood risk. The remainder of the scheme options are located in Flood Zone 1 (low risk), which equates to an area with an annual probability of flooding from rivers or the sea of less than 0.1% (AEP). Flood Zone 2 and 3 are illustrated in Figure 13.1. Flood Zone 1 is the area that is not classed as either Flood Zone 2 or 3. The River Itchen flooded in the northern area of the scheme during the winter of 2013/14.

13.3.15 The River Itchen and Nun's Walk Stream floodplain protect properties downstream from flooding. Residential, school and commercial receptors are described in Section 2.3.2. Parts of the areas of Kings Worthy and Winchester are only elevated approximately 5m higher than the level of the floodplain. Given the proximity of these areas to the River Itchen and the level of the floodplain and adjacent built development, it is anticipated that the River Itchen and Nun's Walk Stream floodplain protect in excess of 100 properties from flooding.

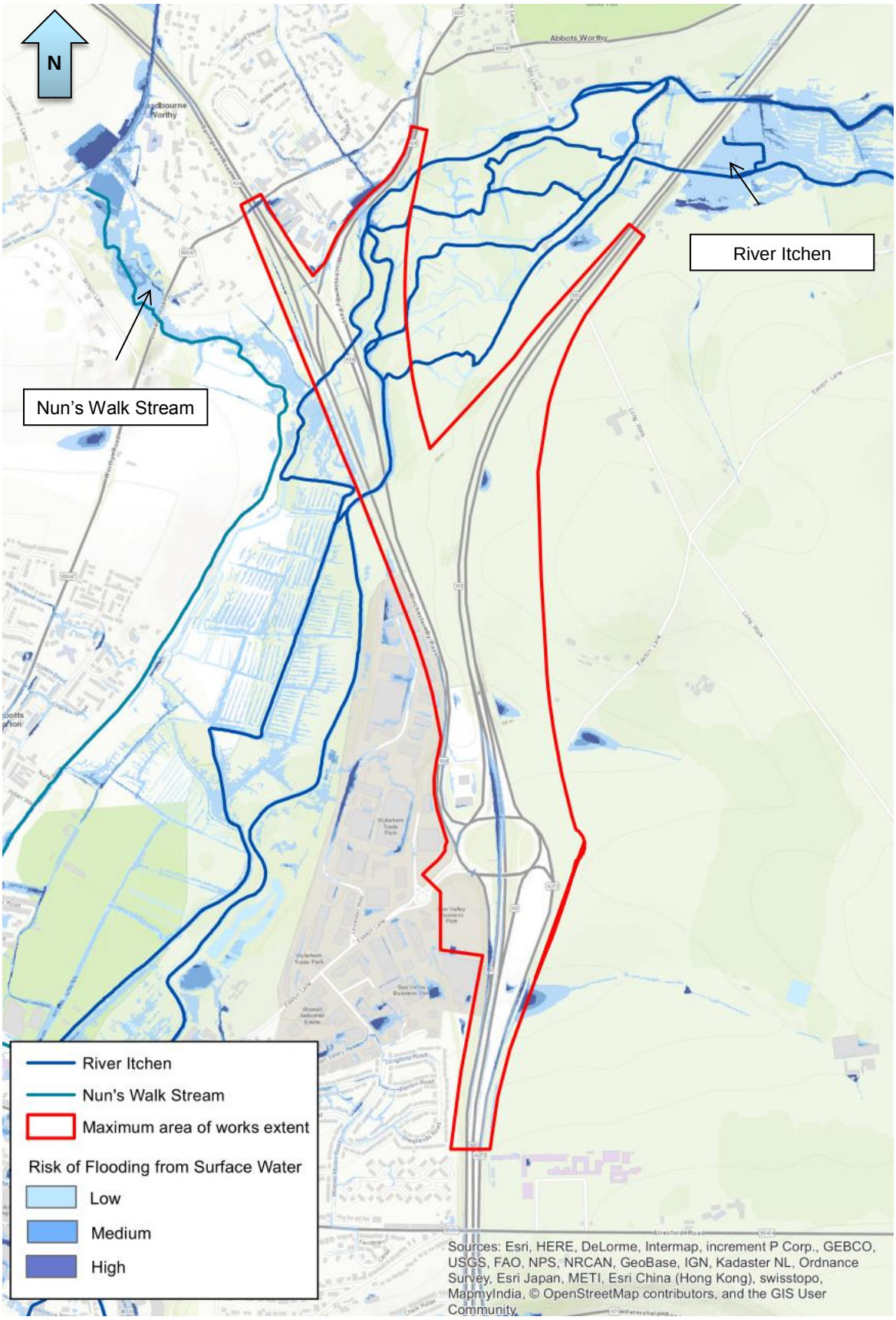
13.3.16 The EA Risk of Flooding from Surface Water map (Figure 13.4) classes the areas affected by the majority of the scheme options as very low risk (less than 0.1% AEP) of flooding from surface water. However, there are some small isolated areas with a low risk (0.1% to 1% AEP) and medium risk (1% to 3.3% AEP) of surface water flooding, which are located where roads cross the River Itchen. Isolated areas at high risk (greater than 3.3% AEP) of surface water flooding are

as follows:

- On the B3047 at the point where it passes beneath the A34 at the north-west limit of works
- To the east of the M3 in the north of the scheme area
- On the M3 at Junction 9
- On and to the west of the A272
- The Junction 9 north-bound on slip

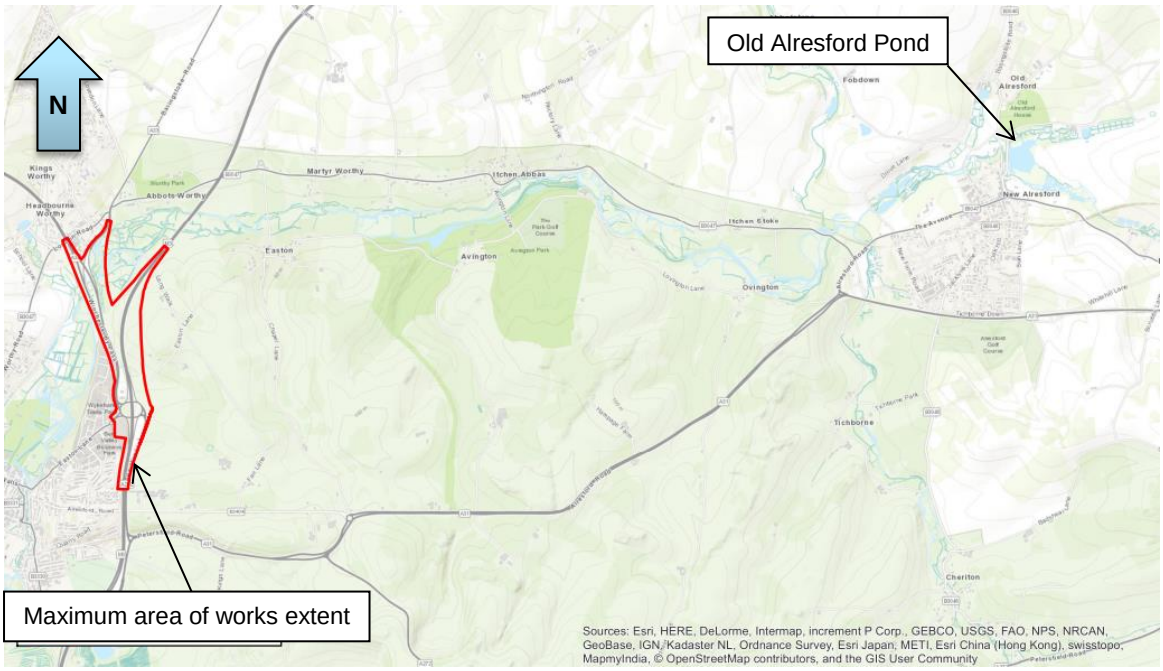
13.3.17 Figure 13.4 shows areas of Winnall, immediately west of the scheme area, are shown to be at 'low', 'medium' and 'high' risk of surface water flooding. Surface water flooding is predicted to occur at low points in the local topography where surface water runoff is modelled to collect during heavy rainfall. Two overland flow routes are also indicated within the vicinity of the scheme area. The first is shown to flow through Kings Worthy, to the north of the scheme area, and is indicated to have a high risk of surface water flooding. The second is associated with the Nun's Walk Stream tributary of the River Itchen which passes through Headbourne Worthy to the north-west of the scheme area. The areas alongside the watercourse are indicated to be at 'low', 'medium' and 'high' risk of surface water flooding.

Figure 13-4: Risk of flooding from surface water



13.3.18 Option 11 is also at risk from reservoir flooding (EA Risk of Flooding from Reservoirs map) in the event of a failure of the Old Alresford Pond (Figure 13.5). Quantified risk data for reservoir flooding has not yet been made available from the EA but will be requested again for PCF Stage 2. The remaining scheme options are not shown to be at risk of reservoir flooding.

Figure 13-5: Location of Old Alresford Pond



13.3.19 The Environment Agency Flood Risk Assessments: Climate Change Allowances (March 2016) states that within the South East River Basin District peak river flow is expected to increase between 10% and 25% within the next 25 years, rising to between 20% and 50% within the next 65 years. Within the next 100 years peak river flow is expected to increase between 35% and 105% within the South East River Basin District. The Environment Agency Guidance also provides the anticipated changes in extreme rainfall intensity for across the country. Over the next 100 years, the increase in extreme rainfall intensity is expected to be between 20% and 40%.

13.3.20 While present day flood extents are used to establish the flood zones at the study area, it is essential to consider the possible change in flood risk over the lifetime of the proposed scheme as a result of climate change. The likely increase in flow and rainfall intensity over the lifetime of the development will be assessed proportionally to the guidance provided by the Environment Agency as outlined above as part of PCF Stage 2 and 3. As part of these works, all surface water drainage features will be designed so as to provide adequate drainage for the proposed scheme for the appropriate climate change allowances.

GROUNDWATER

13.3.21 British Geological Survey mapping indicates that the study area is primarily underlain by the Seaford Chalk Formation. A small outcrop of the Newhaven Chalk Formation may be present on the western boundary of the Site. The Lewes Nodular Chalk Formation underlies the Seaford Chalk Formation which is likely to thin towards the southern extent of the study area.

13.3.22 Superficial deposits are limited across the Site. Alluvium overlies the chalk strata in the north/north-east and north-west of the Site in the vicinity of the River Itchen. Locally a small area of Head deposits may be present within or adjacent to the northwest of the scheme options. Two further bands of superficial Head deposits run perpendicular across the M3/A34/A272 in a west-

east direction, located to the north and south of the existing junction respectively. Additionally, superficial deposits of clay-with-flints may be present along or in the vicinity of the eastern boundary of the study area. River Terrace (sand and gravel) deposits may also encroach onto the north-west and northern sections, associated with the River Itchen.

13.3.23 BGS borehole records were reviewed from along the existing route of the M3. These indicate that Chalk strata have been proven up to at least 45.72m below ground level (maximum drilled depth). The Seaford Chalk which is located near the ground level is weathered and described as 'structureless clayey chalk with occasional presence of flints'. It is possible that the Head deposits are described in the borehole logs as 'brown clay with scattered flints' (Borehole record ref: SU43SE55).

13.3.24 The EA classifies the Seaford Chalk and the Lewes Chalk strata as Principal Aquifers. A Principal Aquifer is defined as layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. These layers of rock or drift deposits may support water supply and/or river base flow on a strategic scale. It is also considered likely that the River Itchen and its tributaries are supported by groundwater base flow from the Chalk bedrock.

13.3.25 Superficial Alluvium, River Terrace and Head Deposits comprising clay, silt, sand and gravel within the extent of the river floodplain and adjacent river banks, are present in close proximity to the River Itchen. The Alluvium and River Terrace Deposits are classified as Secondary A Aquifer by the EA. A Secondary A Aquifer is defined as permeable layers of rock capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The Head Deposits are classified as Secondary Aquifer (undifferentiated). In addition to the above, peat deposits have also been noted from a number of BGS boreholes located in the near vicinity of the existing Junction 9 area.

13.3.26 A review of the EA 'What's In My Back Yard' Groundwater map shows that the northern section of the scheme area falls mostly within an area classified as a Groundwater Source Protection Zone 1 (inner zone). This is associated with the large groundwater abstraction at Easton Pumping Station to the north-east, used for various purposes towards the north of the scheme area. These zones indicate where groundwater is typically used to support public drinking water supplies and therefore the protection of groundwater quality and quantity within these areas is important. Zone 1 is the most sensitive of these protective areas and indicates the zone in which contamination released to the ground could reach the point of abstraction within 50 days. Review of the EA's Water Abstraction Licences map indicates an abstraction by Southern Water within this area. The presence of the Source Protection Zone will be taken into consideration when designing new surface water drainage and spill response systems to ensure protection of groundwater resources.

13.3.27 The groundwater body (River Itchen Chalk) is classified by the EA as having poor chemical and quantitative quality; and is considered to be at risk.

13.3.28 GaugeMap.co.uk shows a groundwater level monitoring station (Harestock) located approximately 3.5km west of the scheme area. The borehole construction detail is unknown. However, it is likely to be founded within the Chalk. The monitoring station has recorded a maximum groundwater level of 63.825m AOD in Quarter 1 of 2014. The monitoring point ground elevation is approximately 100m AOD, the junction at 50m AOD.

13.3.29 Based on topography and the Harestock monitoring station groundwater level information it is likely that groundwater will be generally flowing towards the Itchen from north-east and north-west valley sides towards the south. It is assumed that the Chalk groundwater flow type is a combination of inter-granular and fracture flow until proven otherwise. It is expected that characterisation and monitoring of the local water environment will be required at PCF Stage 2 to assess local hydrodynamics and potential interaction of the general proposed scheme area with the local water environment (surface water, groundwater and local ecosystems). This is expected

to comprise water level monitoring of the local River Itchen system, groundwater level monitoring, flow rate monitoring, water quality baseline monitoring as well as assessment of the permeability of the local ground materials. This will allow a robust sense to be gained of the magnitude and significance of effects of either construction de-watering or road cutting on the water environment, through both construction and operational phases.

13.3.30 The BGS publication 'the physical properties of major aquifers in England and Wales' (Allen, 1997[33]) contains two storage coefficient[34] values recorded on the M3 (0.017 and 0.0303) and a hydraulic conductivity test taken at Itchin Farm Down 6km NE of scheme options. The hydraulic conductivity value is not considered within this report due to the proximity of the test to the scheme options and the variable nature of the Chalk. It should be noted that a ground investigation at Watercress Farm encountered artesian conditions, the exact location of this ground investigation is unknown (Allen, 1997).

Table 13-1: Value (sensitivity of resource)

RESOURCE	VALUE
Itchen and local sensitive ecologically designated areas.	High
Seaford Chalk and the Lewes Chalk Principal Aquifers	High
Head deposits Secondary undifferentiated Aquifers	Medium
Alluvium Secondary A Aquifer	Medium
Water Users	High

13.3.31 Groundwater in the scheme area has been assessed against the objectives of the WFD. The EA South East River Basin Management Plan identifies the groundwater body underlying the scheme to be the River Itchen Chalk with a current WFD quantitative and chemical quality of 'Poor'. Figure 13.6 (Appendix A) indicates the extent of the River Itchen Chalk within the vicinity of the scheme area, as well as the current WFD status of the water body.

13.3.32 The EA Water Abstraction Licences map shows there to be a large groundwater abstraction used for various purposes within the north section of the scheme area. A second, large groundwater abstraction used for agriculture is located approximately 875m to the north-west of the scheme area.

13.3.33 The north and east of the study area is included within the boundary of the SDNP (excluding the area encompassing the existing junction in the south of the scheme options).

13.3.34 Mineral resources comprising sharp sand and gravel are located in the vicinity of the River Itchen in the northern part of the scheme area, identified by Hampshire County Council's Mineral and Waste Plan. Mineral resources identified through the plan are subject to potential safeguarding under Policy 15.

13.3.35 At this stage, the receptors that are most likely to be affected by the scheme options include the following. The importance of the resource is identified as set out in Table 13-1:

[33] Allen et al., (1997) The physical properties of major aquifers in England and Wales. Hydrogeology Group Technical Report WSD/97/34. Environment Agency R&D Publication 8

[34] Storage coefficient: the volume of water released from the aquifer per unit decline in hydraulic head of the aquifer. per unit area of the aquifer

- The River Itchen - the current WFD status of the River Itchen is 'Good' in terms of both ecological and chemical quality. Given the above, it is considered that the importance of this resource is Very High
- The Nun's Walk Stream – the current WFD status of the Nun's Walk Stream is 'Moderate' ecological status and 'Good' chemical status. The Nun's Walk Stream also flows through the River Itchen SSSI. Given the above, it is considered that the importance of this resource is Very High
- The River Itchen Chalk groundwater resource –The importance of this resource is considered to be Very High
- Groundwater users (abstractors and ecologically dependant habitats) of the Chalk groundwater body
- Due to the European and National environmental designations for the River Itchen and Southampton and Solent Water the importance of these receptors is Very High
- People and property – a number of the scheme options are located within an area that is at high risk of fluvial and/or surface water flooding. The proposed widening of the carriageway will change currently permeable soft landscaped areas to hard standing in each of the options. This will result in areas of the floodplain being lost and has the potential to increase the risk of surface water flooding within the scheme area or elsewhere by increasing surface water runoff. The potential for loss of floodplain and the potential for increased flood risk to vulnerable infrastructure in excess of 100 residential properties means the importance of people and property within the vicinity of the scheme area is, therefore, considered to be High

13.4 REGULATORY AND POLICY FRAMEWORK

13.4.1 All the scheme options have a bearing on the water environment and should therefore comply with various European (Floods Directive (2007/60/EC), WFD, Groundwater Directive (2006/118/EC)), national (NPPF, NPS, EP, EAGP) and local policy. Refer to Appendix 2.1 for further detail on this policy.

13.4.2 The northern end of Option 11 where it crosses several watercourses is proposed in an area of Flood Zones 2 and 3. The National Planning Policy Framework (NPPF) requires all projects in Flood Zones 2 and 3 (medium and high probability of river and tidal flooding) to have a Flood Risk Assessment (FRA). The schemes will also need to show that a sustainable means of drainage has been considered in order to meet the requirements of the Flood and Water Management Act 2010.

13.4.3 The scheme will need to accord with the requirements of the WFD and the Groundwater Directive (2006/118/EC), which was developed in response to the requirements of Article 17 of the WFD, which seek to ensure that all surface water and / or groundwater reach 'Good' status (in terms of ecological and chemical quality and water quantity, as appropriate), by 2015 for cycle 1 of implementation and by 2027 for cycle 2.

13.4.4 Early consultation should be undertaken with flood risk management agencies such as the EA, Hampshire County Council, as the Lead Local Flood Authority, Winchester City Council and Southern Water, in order to comply with the National Policy Statement for National Networks. Consultation with Winchester City Council should involve demonstration of how the scheme will meet the requirements of its Policy CP17 which seeks to ensure that flood risk is avoided for new and re-development and promotes the use of Sustainable Drainage Systems (SuDS).

13.4.5 Any proposed works on or affecting a watercourse associated with the preferred option will require an Environmental Permit for Flood Risk Activities to avoid contravening the Environmental Permitting (England and Wales) Regulations 2010.

13.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

13.5.1 Detailed design and mitigation measures are not available at this stage of the design. An assessment of the preferred scheme option and proposed mitigation measures will be undertaken at a later stage in the design process when detailed information is available.

13.5.2 This assessment is based upon preliminary design and will be updated at PCF Stage 2 for all of the options. The proposed mitigation measures should be updated for the preferred option design. Prior to this design, baseline groundwater data (level, quality and permeability) will be collected. Data requests to the relevant stakeholders will also be placed to ensure all water users/receptors are identified ahead of future assessments.

DESIGN ELEMENTS INFLUENCING THE GROUNDWATER ENVIRONMENT

13.5.3 Option 11 includes two large cuttings: the underbridge under the M3 cutting; as well as the M3 SB link to the A34 link to roundabout cutting. A smaller cutting exists on the M3 NB link to A34. scheme construction may require active groundwater controls to mitigate intercepted groundwater.

13.5.4 Option 14 includes a moderate-sized cutting along the proposed M3 SB Link to A34 Link to Roundabout structure. The A34 SB Link to M3 structure also contains a small cutting.

13.5.5 Option 16A will employ an underbridge for the A34 SB link to M3 structure. This will require the installation of large cutting. The M3 SB link to the A34 link to roundabout will also require the installation of a moderately-sized cutting.

13.5.6 Option 16B contains one long cutting; the A34 SB link to roundabout.

13.5.7 Option 18 will include the installation of a small cutting within the M3 J9 roundabout.

13.5.8 The construction details of the below-ground structures (i.e. cuttings) are currently unknown. The dimensions of these construction elements will inform the relationship and interaction with, groundwater and whether groundwater management will be required. For the purposes of this exercise it is assumed active groundwater management will be required in order to construct and install below-ground structures.

13.6 OVERALL ASSESSMENT

13.6.1 The scheme options have the potential to impact the water environment during construction and operation. An assessment of the potential impacts of each option and a comparison between the options is provided below.

CONSTRUCTION EFFECTS

13.6.2 Potential effects to surface water features, groundwater features and flood risk during construction could arise from:

- Impacts on the water quality of identified water features (i.e. the River Itchen, Nun's Walk Stream and/or the groundwater bodies) in the vicinity of the construction works from mobilised suspended solids or spillage of fuels, lubricants, cements and hydraulic fluids from construction plant if there are inadequate mitigation measures in place
- Interception of overland flood flow routes which could cause localised flooding of low lying road sections

- The excavation for and construction of below ground structures i.e. cuttings may intercept the groundwater table. Where groundwater intercepts occur, groundwater management (active or passive dewatering) will be required. Groundwater management has the ability to impact upon groundwater receptors

13.6.3 At this stage little is known about the existing highway drainage system but it is considered likely that any discharge from the scheme options will drain to a system of SuDS before being discharged to the River Itchen. There is therefore a risk of suspended solids, fuels, lubricants from construction plant and cements discharging to this watercourse through the surface water drainage system. It is not anticipated that discharge from the scheme options will drain directly to the Nun's Walk Stream given that the existing A34 is located between the scheme options and the watercourse.

OPTION 11 – SURFACE WATER

13.6.4 The overall footprint of the options is similar, except Option 18, which is significantly smaller than the other options. Option 11, however, may pose the greatest risk to the pollution of identified water features. This is primarily due to Option 11 needing the largest scale of works as the proposed alignment is longer than the other options and the need for the alignment to cross the River Itchen in three locations (the other options do not cross the River).

13.6.5 The potential adverse effects associated with all scheme options will be mitigated through the implementation of a CEMP. Potential for residual effects is likely to remain given the potential short distance of the highway drainage system to the River Itchen. The potential effect to surface water features, most notably the River Itchen, associated with pollution risks is considered to be Moderate Adverse to Slight Adverse given the Minor Adverse to Negligible Adverse impact magnitude and Very High importance of the watercourse.

13.6.6 There is also the potential for adverse effects from direct migration of pollutants to the ground and the Principal Aquifer (Seaford and Newhaven Chalk Formation) underlying the scheme. This too will be mitigated through the implementation of the CEMP and therefore the magnitude of the impact is likely to be Negligible Adverse and a Neutral effect.

13.6.7 The need for the Option 11 alignment to cross the River Itchen may also result in additional impacts in terms of flood risk and on the river itself. It is possible that the River Itchen channel will need to be diverted to enable the construction of the watercourse crossings, especially if these crossings are culverts. The diversion of the watercourse may result in an increase in flood risk if the diversion channel is not sufficient to handle the flows or is not appropriately sited. The diversion may also result in damage to the river environment as a result of low flows through the original channel or damage to the banks/bed as a result of the channel construction. The risk of flooding associated with diversion works is considered to be high and the magnitude of the potential impact is likely to be Major Adverse, with an effect of Major Adverse given the importance of residential receptors located nearby.

OPTIONS 11, 14, 16A AND 16B – SURFACE WATER

13.6.8 The construction works for all of the other options may increase flood risk to those options. The proposed works could alter overland flow paths, potentially increasing the risk of ponding water on the site and in the locale. During construction, consideration should be given to the management of surface water runoff and overland flow to adequately manage these potential adverse effects. It is considered unlikely that this will pose a notable risk of flooding and the magnitude of the potential impact is likely to be Negligible Adverse, with an effect of Slight Adverse given the High importance of residential receptors located nearby.

13.6.9 It is considered possible that flood water will be displaced to areas outside of the scheme as a result of the construction works for Options 11, 14, 16A and 16B, due to construction taking place in areas within Flood Zone 2 and 3 and in areas indicated to be at risk of surface water flooding.

This will result in a loss of flood storage area. At this stage of scheme design the predicted magnitude associated with the impact of this work is Major Adverse. The construction works for Option 18 are wholly located in Flood Zone 1 and is not indicated to be at risk of surface water flooding. It is therefore, considered highly unlikely that flood water would be displaced to areas outside of the scheme, with a predicted impact of No Change and the effect of the construction on flooding is considered to be Neutral.

Table 13-2: Summary of potential construction effects

OPTION	RECEPTOR	IMPACT	SIGNIFICANCE
Option 11 – Surface Water	River Itchen	Pollution risks	Moderate Adverse
	Nun's Walk Stream	Pollution risks	No Change
	River Itchen	Flow diversion	Major Adverse
	People and property elsewhere	Interception of overland flow routes	Slight Adverse
	People and property elsewhere	Displacement of flood waters	Major Adverse
Option 11 - Groundwater	Groundwater Resources	Pollution risks	Neutral
	Aquifer	Water balance	Negligible adverse
	Water Users	Quantitative and qualitative impacts to groundwater users	Moderate adverse
	River Itchen (groundwater source)	Reduced groundwater base flow	Moderate adverse
	River Itchen SSSI	Removal of groundwater supporting water dependent habitats (including wetlands)	Major adverse
Option 14 – Surface Water	River Itchen	Pollution risks	Moderate Adverse
	Nun's Walk Stream	Pollution risks	No Change
	People and property elsewhere	Interception of overland flow routes	Slight Adverse
	People and property elsewhere	Displacement of flood waters	Major Adverse
Option 14 - Groundwater	Groundwater Resources	Pollution risks	Neutral
	Aquifer	Water balance	Negligible adverse
	Water Users	Quantitative and qualitative impacts to groundwater users	Moderate adverse
	River Itchen (groundwater source)	Reduced groundwater base flow	Moderate adverse
	River Itchen SSSI	Removal of groundwater supporting water dependent habitats (including wetlands)	Major adverse
Option 16A – Surface Water	River Itchen	Pollution risks	Moderate Adverse
	Nun's Walk Stream	Pollution risks	No Change
	People and property elsewhere	Interception of overland flow routes	Slight Adverse
	People and property elsewhere	Displacement of flood waters	Major Adverse
Option 16A - Groundwater	Groundwater Resources	Pollution risks	Neutral
	Aquifer	Water balance	Negligible adverse

OPTION	RECEPTOR	IMPACT	SIGNIFICANCE
	Water Users	Quantitative and qualitative impacts to groundwater users	Moderate adverse
	River Itchen (groundwater source)	Reduced groundwater base flow	Moderate adverse
	River Itchen SSSI	Removal of groundwater supporting water dependent habitats (including wetlands)	Major adverse
Option 16B – Surface Water	River Itchen	Pollution risks	Moderate Adverse
	Nun's Walk Stream	Pollution risks	No Change
	People and property elsewhere	Interception of overland flow routes	Slight Adverse
	People and property elsewhere	Displacement of flood waters	Major Adverse
Option 16B - Groundwater	Groundwater Resources	Pollution risks	Neutral
	Aquifer	Water balance	Negligible adverse
	Water Users	Quantitative and qualitative impacts to groundwater users	Moderate adverse
	River Itchen (groundwater source)	Reduced groundwater base flow	Moderate adverse
	River Itchen SSSI	Removal of groundwater supporting water dependent habitats (including wetlands)	Major adverse
Option 18 – Surface Water	River Itchen	Pollution risks	Moderate Adverse
	Nun's Walk Stream	Pollution risks	No Change
	People and property elsewhere	Interception of overland flow routes	Slight Adverse
	People and property elsewhere	Displacement of flood waters	Neutral
Option 18 - Groundwater	Groundwater Resources	Pollution risks	Neutral
	Aquifer	Water balance	Negligible adverse
	Water Users	Quantitative and qualitative impacts to groundwater users	Moderate adverse
	River Itchen (groundwater source)	Reduced groundwater base flow	Moderate adverse
	River Itchen SSSI	Removal of groundwater supporting water dependent habitats (including wetlands)	Major adverse

GROUNDWATER

13.6.10 Removal of groundwater from dewatering activities for the construction of below ground structures could temporarily impact upon the mass water balance of the local environment, including the Chalk groundwater aquifer. The quantities of water involved would likely form a negligible proportion of groundwater available in the Chalk aquifer. Water recycling practices would mitigate this impact.

13.6.11 Local groundwater users could be sensitive to groundwater elevation reduction changes. Removal of groundwater though construction of cuttings could have a temporary adverse impact upon these users. Mitigation options include water user pump lowering, re-drilling of water well(s), and provision of water whilst the construction phase is completed.

13.6.12 The River Itchen could be groundwater fed at this location. Dewatering groundwater to enable the construction of below-ground structures could temporarily have an impact on the River. Water recycling practices could assist in reducing dewatering impact magnitude.

13.6.13 The River Itchen SSSI contains Fen (wetland) water dependent habitats. Draining groundwater temporarily from this habitat could have a permanent negative impact. Water recycling practices may lessen the magnitude of the impact however due to the geospatial requirement to keep all areas as wetlands; an adverse impact may be unavoidable.

13.6.14 Without site specific water environment characterisation and monitoring data and quantification of impacts, the most preferable option in respect of construction is unknown at this stage. Construction effects on the water environment will be a function of the nature, duration, phasing and sequencing of any interim conditions that are required to construct a particular element of the proposed scheme. These are unknown at the time of writing.

OPERATIONAL EFFECTS

13.6.15 Where groundwater continues to intercept below-ground features, groundwater mitigation may be required for the operation of all of the scheme options. Key potential operational effects include altering the local groundwater and surface water flow-nets and affecting local hydrodynamics (rainfall, surface water and groundwater interactions).

13.6.16 Potential effects on surface water features, groundwater features and flood risk during operation could arise from:

- Polluted surface water runoff consisting of silts or hydrocarbons from the scheme options may migrate or be discharged to surface water or groundwater features
- Increased rates and volumes of surface water runoff from an increase in impermeable area and/or changes to the existing drainage regime leading to a potential increase in flood risk
- Increased flood risk associated with the location of the scheme options within an area at risk of flooding
- Loss of local flows that support a particular local habitat; changes in local hydraulic gradients that support flows
- Altering flows so that groundwater emergence/local flooding could take place notably in features located at low elevations on the scheme options
- De-watering effects from cuts causing the groundwater table above the hydraulic gradient of the cut to reduce and in so doing impacting on the flora, fauna and water users that the groundwater supports

13.6.17 Additionally, sustained periods of rainfall resulting from a changing climate, notably the occurrence of wetter winters, which are predicted in the south of England over the next several decades (http://ukclimateprojections.metoffice.gov.uk/23674?emission=medium) could periodically result in the rise of local groundwater levels and these could result in increased incidents of seepage and emergence of water. Elevated groundwater levels could also affect the efficiency of stormwater management controls that will operate over the lifetime of the road assets.

13.6.18 The proposed works intend to improve traffic flow within the area. However, at this stage it is not known whether the works will cause a notable increase in vehicular movements. The proposed works may result in more people using the junction than do currently due to improved traffic movement.

13.6.19 At this stage little is known about the existing highway drainage system but it is considered likely that any discharge from the scheme options will include appropriate measures to reduce potential effects associated with an increase in the pollutants to the River Itchen. It is not anticipated that discharge from the scheme options will drain directly to the Nun's Walk Stream given that the existing A34 is located between the proposed study area and the watercourse. It is therefore, possible that the proposed options scheme will result in an increase in the deposition of pollutants that may be transferred to the water environment via the highway drainage system. The magnitude of the impact to surface water or groundwater features therefore has the potential to be Moderate to Major Adverse.

13.6.20 The new alignment will be served by appropriate measures, which will include sufficient water treatment measures. Potential effects associated with an increase in the deposition of pollutants to the water environment are therefore, considered to be Minor Adverse given the Minor Adverse impact magnitude and Very High importance of the local surface and ground water bodies and European and National environmental designations.

13.6.21 All proposed options will introduce new hardstanding areas that will lead to an increase in the rate and volume of surface water runoff. Option 11 is likely to generate the largest increase in impermeable surface associated with the longer extent for this alignment, followed by Options 14, 16A and 16B and finally, Option 18. The new alignment will be served by appropriate measures and attenuation of flow will be provided where necessary. At this stage of the assessment, the magnitude of the impact is therefore likely to be Negligible Adverse. Potential effects associated with increased flood risk as a result of increased surface water runoff are considered to be Negligible Adverse given the Negligible Adverse impact magnitude and High sensitivity of nearby residential properties.

13.6.22 Works associated with Option 11 are proposed in areas at fluvial flood risk (Flood Zone 2 and 3). The introduction of raised hardstanding in the flood plain may have a significant impact on flood flows and result in the loss of flood storage areas. At this stage of the assessment further details on the design of the raised sections of the road alignment are not known. The magnitude of the impact is therefore currently assessed to be Major Adverse. Potential effects associated with increased flood risk as a result of displacement of fluvial flood water are considered to be Major Adverse given the Major Adverse impact magnitude and Very High importance of surface water bodies, European and National environmental designations and nearby residential properties.

13.6.23 Works associated with Option 11 may also include culverts to enable the road to cross the River Itchen. The introduction of culverts may have a significant impact on flows in the river and increase the risk of flooding associated with the watercourse. At this stage of the assessment further details on the watercourse crossings are not known. The magnitude of the impact is therefore currently assessed to be Major Adverse. Potential effects associated with increased flood risk as a result of displacement of fluvial flood water are considered to be Major Adverse given the Major Adverse impact magnitude and Very High importance of surface water bodies, European and National environmental designations and nearby residential properties.

13.6.24 Options 11, 14, 16A and 16B are also located within areas identified to be at risk of surface water flooding. This is associated with overland flow that may enter the carriageway and exceed the capacity of the highway drainage system. The proposed works are not considered likely to increase this risk. Nonetheless, it is recommended that consideration is given to the management of this risk during the detailed design of the carriageway and provision of an appropriate surface water drainage system. The potential impacts to the scheme and to people and property elsewhere as a result of surface water flooding associated with the scheme are assessed to be No Change with a Neutral effect.

13.6.25 For Option 18, no works are proposed in areas at fluvial or surface water flood risk. The potential impacts to the scheme, people and property elsewhere as a result of this alignment are assessed to be No Change with a Neutral effect.

Table 13-3: Summary of operational effects – surface water

OPTION	RECEPTOR	IMPACT	SIGNIFICANCE
Option 11	River Itchen	Pollution risks	Major Adverse
	Nun's Walk Stream	Pollution risks	Neutral
	European and National environmental designations	Pollution risks	Major Adverse – Moderate Adverse
	Groundwater resources	Pollution risks	Major Adverse
	People and property elsewhere	Increased surface water runoff	Slight Adverse - Neutral
	River Itchen	Displacement of flood waters	Major Adverse
	River Itchen	Inclusion of culverts	Major Adverse
	European and National environmental designations	Displacement of flood waters	Major Adverse
	People and property elsewhere	Displacement of flood waters	Major Adverse
Option 14	River Itchen	Pollution risks	Major Adverse
	Nun's Walk Stream	Pollution risks	Neutral
	European and National environmental designations	Pollution risks	Major Adverse – Moderate Adverse
	Groundwater resources	Pollution risks	Major Adverse
	People and property elsewhere	Increased surface water runoff	Slight Adverse - Neutral
Option 16A	River Itchen	Pollution risks	Major Adverse
	Nun's Walk Stream	Pollution risks	Neutral
	European and National environmental designations	Pollution risks	Major Adverse – Moderate Adverse
	Groundwater Resources	Pollution risks	Major Adverse
	People and property elsewhere	Increased surface water runoff	Slight Adverse - Neutral
Option 16B	River Itchen	Pollution risks	Major Adverse
	Nun's Walk Stream	Pollution risks	Neutral
	European and National environmental designations	Pollution risks	Major Adverse – Moderate Adverse
	Groundwater Resources	Pollution risks	Major Adverse
	People and property elsewhere	Increased surface water runoff	Slight Adverse - Neutral
Option 18	River Itchen	Pollution risks	Major Adverse
	Nun's Walk Stream	Pollution risks	Neutral
	European and National environmental designations	Pollution risks	Major Adverse – Moderate Adverse
	Groundwater Resources	Pollution risks	Major Adverse
	People and property elsewhere	Increased surface water runoff	Slight Adverse - Neutral

13.6.26 Presently there is no site specific hydrodynamic data that define the hydraulic characteristics of the Chalk, which are likely complex due to inter-granular and fracture flow. In addition, potential operational effects of the scheme with the water environment require a good understanding of the baseline water environment conditions in the vicinity of the scheme. These conditions include the nature, degree of variance and trends in hydrodynamics; combined surface water (the River

Itchen system) levels, groundwater levels, rainfall as a result of seasonal variations, notably through winter periods, water quality data and flow rate data. Therefore it is not possible to conclude which of the presented scheme options could be most preferable in regards to groundwater/the wider water environment.

13.7 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

13.7.1 Limited information is currently known regarding the capacity of the existing highway drainage system or the location of outfalls to the water environment. This will need to be investigated during a site visit and consultation with the relevant authorities undertaken at PCF Stage 2.

13.7.2 At present, the surface water drainage strategy for each of the options has not been devised. The impact of the proposed scheme options on the water environment will depend on the use of SuDS and the design of the overall surface water drainage strategy. This assessment will need to be updated once this information is known for the preferred option at PCF Stage 3.

13.7.3 The EA's hydraulic model for the River Itchen has not been obtained at this time. This model will need to be obtained from the EA and each of the options added to accurately determine the associated impact on flood risk at PCF Stage 2.

13.7.4 The preliminary option drawings provided (Figure 3.1-3.5) contain a scale. However, the depth of the cuttings is difficult to interpret and a data request has been placed for the precise inverts of the cuttings as mentioned above. Accurate groundwater assessment is contingent on the availability of groundwater level and quality data. Without this information only a general assessment can be made. The assessment will require to be updated on receipt of this information.

13.7.5 Limited information has been provided for the production of the Environmental Study Report at PCF Stage 1. To make accurate assessment of the options provided, baseline data must be obtained and will be provided at PCF Stage 2. Generalisations of the ground impacts have been made in this Environmental Study Report and will be updated on receipt of baseline groundwater information.

13.8 SUMMARY

13.8.1 Option 11, is considered to have the greatest likelihood of resulting in adverse effects on the water environment. This is primarily due to Option 11 needing the largest scale of works as the proposed alignment is longer than the other options and the need for the alignment to cross the River Itchen in three locations (the other options do not cross the river). Given the National and European designations of the River Itchen, the crossing of the watercourse increases the risk of this option having significant effects to the surface water features within the study area. There is also the potential for adverse effects from direct migration of pollutants to the ground and the Principal Aquifer (Seaford and Newhaven Chalk Formation) underlying the scheme. The need for the Option 11 alignment to cross the River Itchen may also result in additional impacts in terms of flood risk and on the river itself. The potential for adverse effects will be assessed in more detail at PCF Stage 2 when further design information will be available.

13.8.2 Options 14, 16A, 16B and 18 all have the potential to increase the risk of surface water and groundwater pollution, as well as increasing flood risk within the study area and to neighbouring areas; however these options do not cross the River Itchen and are therefore, anticipated to have a lower potential to result in adverse effects on the water environment. Option 14 is anticipated to have the next greatest potential for adverse effects after Option 11, as it will involve the next greatest extent of works. The potential pollution risks to surface water and groundwater bodies from the construction and operation of the highway alignment are therefore, greater than those for options 16A, 16B and 18. Option 16A is anticipated to have the next greatest potential for adverse effects on the water environment, again due to the scale of the extent of the works followed by Option 16B.

13.8.3 Option 18 is least likely to result in significant effects to the water environment due to the limited footprint located within the existing junction and because it requires the least structures and interventions. Furthermore, Option 18 is the only option that is not at risk of fluvial or surface water flooding and will thereforer not impact on flood risk within the scheme area or surrounding study area.

13.8.4 The potential adverse effects associated with the construction of all scheme options will be mitigated through the implementation of a CEMP. Potential for residual effects is likely to remain for Options 11, 14, 16A and 16B given the potentially short distance of the highway drainage system to the River Itchen.

13.8.5 The proposed drainage strategy for all options will incorporate attenuation and treatment stages. Flood storage displacement will be mitigated by compensatory storage and / or features that accommodate obstructed flow routes. Any proposed crossings will incorporate mitigation measures to reduce their effect on ecology. At this stage the above mitigation measures have not been confirmed. Further investigation on the types and location of mitigation measures that will be required will be undertaken as part of PCF Stage 2 and 3.

13.8.6 It is not possible to differentiate between the proposed options in relation to groundwater, based on the limited information that is currently available. If groundwater is intercepted by the scheme options, groundwater mitigation will be required. A detailed information gathering exercise will be completed at PCF Stage 2 in order to enable conceptualisation and assessment of the scheme options impact to the groundwater environment.

14 ASSESSMENT OF CUMULATIVE EFFECTS

14.1 INTRODUCTION

14.1.1 Cumulative effects can be defined as impacts that “result from multiple actions on receptors and resources and over time and are generally additive or interactive (synergistic) in nature. Cumulative impacts can also be considered as impacts resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project” (Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interaction, European Commission, May 1999, cited in DMRB 11.2.5; HD 205/08). Broadly, cumulative effects are those which result from the accumulation of a number of individual effects that may also have synergistic aspects.

14.2 STUDY AREA

14.2.1 The spatial scope of the cumulative effects assessment is taken to be the potential physical extent of the options and a 500m buffer around it. At this early stage in design, the cumulative effects assessment focuses exclusively on potential cumulative effects associated with the improvement options, rather than investigating cumulative effects with different schemes.

14.3 ASSESSMENT METHODOLOGY

LEGISLATION AND GUIDANCE

14.3.1 The improvement options which are being considered within this assessment may eventually require the applicant to carry out a full Environmental Impact Assessment (EIA); however, applicable guidance used for this assessment includes the European Union (EU) (1999) European Directorate XI: Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

14.3.2 The EIA Regulations require projects, as part of the environmental assessment process, to identify the potential for, and assess where present, the beneficial or adverse impact of cumulative effects in the wider environmental context.

14.3.3 DMRB 11.2.5 (HD 205/08) and Part 6 (HD 48/08) have also been referred to as guidance to assess the cumulative effects of the improvement options.

SCOPE OF ASSESSMENT

14.3.4 This assessment focuses on cumulative impacts from a single project. These are impacts arising from the combined action of a number of different impacts upon a single resource or receptor.

14.3.5 This assessment identifies the specific receptors that would experience a number of different impacts from the construction and operational stages of the improvement options. The significance of potential cumulative impacts has been described, but is not assigned an overall significance at this stage of assessment.

14.4 INTRA-PROJECT EFFECTS

PEOPLE AND COMMUNITIES

14.4.1 Option 11 is likely to have the most severe construction impact on people and communities, followed by 14, 16A, 16B and 18. This is because Option 11 involves the largest scale of groundworks of all the scheme options. Therefore, it follows that the environmental impacts are likely to be greater when compared to the other scheme options. Residential and commercial properties are likely to experience impacts associated with environmental nuisance during construction. Environmental nuisance is likely to be through impacts from noise, vibration, construction related dust, and impacts to traffic movements in the local area and as a result of the traffic management measures required during construction. Disturbance related to changes in traffic movements may also occur along connecting roads and other routes of travel.

14.4.2 As Option 18 contains the lowest level of ground works of all options it is expected that it will also take the shortest time to complete. The options with increased construction time would likely lengthen the time of environmental disturbance experienced by local people and communities. Option 11 is likely to have the longest construction times followed by Option 14, 16A, 16B and 18.

14.4.3 During operation all Options are expected to improve traffic flows and reduce congestion which has the potential to improve air quality locally for people and communities. Increased levels of accessibility are expected resulting from the introduction of new NMU facilities and improvements to current ones.

PROTECTED SPECIES

14.4.4 It is expected that construction noise has the potential to increase environmental disturbance on any potential habitat which may harbour protected species e.g. bats, should any be discovered once targeted species surveys have been undertaken. There may be a cumulative impact with the construction lighting which has the potential to disturb foraging routes of bats; if present. If breeding birds are present within, or adjacent to, the scheme extent they are likely to be impacted by similar environmental disturbance as human residents in the same area (dust and noise) and the loss of breeding bird habitat, until any landscape planting matures. As the scale of the works and footprint required for Option 11 is larger, the construction programme is expected to be longer when compared to Option 14, 16A, 16B and 18. Therefore any disturbance is likely to be over a longer time period.

14.4.5 There is also likely to be a residual risk to protected species within the River Itchen SSSI should there be any accidental spillages of fuels and oils and silt, which then reach the River Itchen. There is also a risk that draining groundwater temporarily from this habitat could have a permanent negative impact. During the construction this will be mitigated through the CEMP and design measures will be built into the scheme as required once the scheme is complete and operational.

14.5 INTER-PROJECT EFFECTS

This assessment does not feature an assessment of cumulative impacts from different projects (in combination with the project being assessed), as described in DMRB 11.2.5 (HD 205/08) and Part 6 (HD 48/08). The main expected cumulative impacts from different projects with the M3 J9 are considered likely to be from changes to the flows of traffic, and the associated environmental impacts on noise and air quality. The traffic modelling which would enable such an assessment is currently not available. The assessment of these effects should be undertaken at a later PCF stage when traffic data is available, if required.

15 OUTLINE ENVIRONMENTAL MANAGEMENT PLAN

15.1.1 Table 15-1 provides a summary of the environmental mitigation and management measures that will be required, based on the current level of understanding of the impacts of the overall scheme. At this stage generic measures are provided that are likely to be required for all of the scheme options currently being proposed. The specific detail of mitigation required will need to be revisited once an option has been selected and the impacts can be better understood.

Table 15-1: Outline environmental management plan

TOPIC	SENSITIVE RECEPTORS	POTENTIAL IMPACT	MANAGEMENT MEASURES	TIME FRAME
Air Quality	Local residential and pedestrians Ecological Receptors AQMA in Winchester	Disturbance and pollution caused by dust creation. Impact on human health from NO_x and PM_{10} emissions due to construction traffic causing congestion.	Good Practice Measures in a CEMP. Traffic Management Plan	CEMP to be in place prior to construction and measures to be employed throughout construction
Cultural Heritage	Unknown buried remains	Impact on the remains from intrusive groundworks.	A programme of investigative archaeological fieldwork would be required to assess the potential for archaeological remains to be present within the scheme area	Prior to construction
	Heritage Assets including Scheduled Monuments, Listed Buildings, Registered Park and Garden, Conservation Area and Non-designated historical landscapes	Impact on historic setting Direct impact on historic buildings due to demolition	High quality design Undertake Setting Assessment including Historical Landscape Assessment Building Investigation for historic buildings subject to direct impacts	Prior to submission for approval
Landscape	Occupants of residential properties and pedestrians	Loss of visual amenity	Good design and landscape planting, CEMP, Landscape and ecological plan	During the development of the design
Nature Conservation	Designated Sites (SAC, SPA, Ramsar, SSSI, LWS)	Habitat loss, fragmentation, degradation or disturbance	Assessment of Impacts on European Sites, undertake species surveys including bats survey	As part of an update to the ESR
	Valued habitats including ancient woodland	Temporary disturbance or permanent loss of these habitats	Option selection, design of structures, layouts, management plan, CEMP and aftercare plan	As part of an update to the ESR

TOPIC	SENSITIVE RECEPTORS	POTENTIAL IMPACT	MANAGEMENT MEASURES	TIME FRAME
	Protected species	Loss of habitat, disturbance and direct harm	Undertake Phase I and II species surveys e.g. dormouse, otter, water vole, badger and bats, to determine exact management measures required.	As part of an update to the ESR at later stage in design process to reduce likelihood of surveys going out-of-date
Geology and Soils	Geology and soils, construction workers and water resources	Contamination, accidental spillage	Good Practice measures in a Construction Environmental Management Plan	CEMP to be in place prior to construction and measures to be employed throughout construction
	End users and structures	Damage to the structure	Ground Investigation to determine necessary measures to ensure integrity of foundations	During the development of the design
Materials	Waste disposal facilities and sources of materials	Use of finite resources and the production of waste	Site Waste Management Plan (SWMP) and Material Management Plan	SWMP to be in place prior to construction and measures to be employed throughout construction
Noise and Vibration	Residential properties	Nuisance effects from construction noise	A detailed assessment of construction noise will be undertaken once detailed design and construction methods are available Noise management and Best Practice Measures will also be outlined in the CEMP.	Noise limits and working hours will be agreed with the local authority prior to construction works beginning. The CEMP should set out best practice measures to reduce noise
	Residential properties	Operational noise effects	Incorporation of low noise surfacing or acoustic barriers into design	During the development of the design
People and Communities	Public rights of way	Severance during construction	Ensure that severance of routes is phased wherever possible to minimise disturbance. Provide diversions to reduce impact.	To be included within the CEMP and carried out as required during the construction phase
	Motorised users of the road; and NMU of road and off-road routes	Reduced views from the road Change in levels of driver stress Reduction in NMU amenity and journey length	Consideration of landscape screening of the road wherever possible Use of Best Practice construction methods to reduce disruption to users of facilities within vicinity Deregistration of Common Land if required Agricultural Land Assessment to determine in detail the quality of the agricultural land.	Prior to submitted for approval
	Users of community facilities; Registered Common Land Owners; users of private property; and Agricultural Land classified	Community severance Loss of private assets Loss of BMV Agricultural Land		

TOPIC	SENSITIVE RECEPTORS	POTENTIAL IMPACT	MANAGEMENT MEASURES	TIME FRAME
	as BMV			
Road Drainage and the Water Environment	Floodplain	Increased flood risk	Prepare a flood risk assessment and ensure any required attenuation can be accommodated within the scheme design	To be considered during detailed design and in an update to the ESR, prior to submitting for approval
	Surface and groundwater Quality	Deterioration in quality and quantity	Best Practice Measures in a Construction Environmental Management Plan	Prior to construction

16 CONCLUSION

16.1 KEY CONSTRAINTS ASSOCIATED WITH THE SCHEME

16.1.1 There are a number of key constraints associated with the scheme which including the following:

- The River Itchen (SSSI, SAC, Flood Zone 3)
- Noise Sensitive Receptors (NSRs)
- SDNP
- Groundwater Source Protection Zone 1 (inner zone)
- Historic Landfills within the scheme area
- Agricultural Land Class Grade 3 and 4
- Potentially buried heritage assets and designated sites within 1km of the scheme
- PROW that cross the scheme

16.2 SUMMARY OF THE POTENTIAL EFFECTS

16.2.1 The following is a summary of the potential effects of the scheme in relation to each environmental topic under consideration.

AIR QUALITY

16.2.2 The risk of a significant construction air quality effect, either in terms of human receptors or designated scheme receptors, will be minimised by appropriate measures in the CEMP, which will be applied throughout the construction phase.

16.2.3 During operation, Option 11 is likely to result in fewest adverse air quality impacts, as it has fewest human receptors in close proximity (50m) to the option alignment. Residential premises in the Abbots Worthy area would experience an improvement in air quality, due to the shift in centreline of the A34/A33, although this benefit is likely to be marginal. The other options will have a very similar impact, but can be ranked from lowest to highest in terms of exposure to air pollutants: with Option 11 followed by 16B, 18, 14 and 16A.

16.2.4 Option 11 is likely to result in the least impact on SAC and SSSI designations as traffic emissions will affect smaller areas of the designated sites than other options on the basis of the changes in road alignment. Option 11 is followed by options 14, 16B, 16A and 18, in terms of the options least likely to result in adverse impacts on the SAC and SSSI.

16.2.5 All ‘with scheme’ options are likely to improve traffic movements compared to the ‘without scheme’ scenario. They all have the potential to result in air quality benefits at human receptors and designated sites within the study area, dependent upon the trip generation and the redistribution of traffic as a result of the scheme.

CULTURAL HERITAGE

16.2.6 Options which impact on nationally significant heritage assets should be avoided where possible, however, if unavoidable, they would require careful mitigation through the design. All other physical impacts to non-designated heritage assets can be mitigated through preservation by record.

16.2.7 Options 11, 14, 16A and 16B all have the potential for direct physical construction impacts on known and previously unrecorded buried archaeology and earthworks. Option 11 could potentially have a physical impact on nationally significant water meadows and therefore has the greatest potential for harm due to direct physical impacts on nationally significant heritage assets.

16.2.8 Options 14, 16A, and 16B are similar in terms of their potential for harm, they are however considered to be less adverse than Option 11 as they cover a smaller area and the effects can be mitigated for. Options 14, 16A and 16B have the potential to have an adverse impact on non-designated buried archaeology and earthworks of up to regional significance, however, direct qualitative comparisons between them cannot be made without further, more detailed, assessment.

16.2.9 Option 18 is considered to have a neutral effect on the historic environment. Due to the work previously undertaken during the original construction of the junction it is unlikely that the necessary works will create any additional impact to buried archaeology. The additional sections of carriageway will potentially be at the same elevation, or slightly higher, than the existing road layout and therefore this option is unlikely to have any impact on the setting of designated or locally listed assets.

16.2.10 There would be no further impacts on heritage and historic resources during the operational phase of the options.

LANDSCAPE

16.2.11 The M3 is located adjacent to and partially within the SDNP. The extent of the direct and indirect effects on the SDNP will be relatively small and localised, in comparison to the large size of the SDNP. The overall magnitude of change on the SDNP as a whole would be low to negligible for Options 11, 14 and 16A, reducing to negligible for Option 16B and no change for Option 18, assuming appropriate mitigation.

16.2.12 The level of effect on landscape character would be slight adverse for Options 11, 14 and 16A reducing to neutral for Options 16B and 18. Significant visual effects would be limited to Options 11, 14 and 16A with more limited effects on Options 16B and 18.

16.2.13 The options which avoid Easton Down (Options 16B and 18) perform best in landscape and visual terms and are therefore ranked higher than the other options. Option 18 is ranked above Option 16B as it is slightly less visually intrusive. The lower ranking options are those which extend across Easton Down (Options 11, 14 and 16A). The ranking of options in terms of landscape and visual receptors is as follows: Option 18, Option 16B, Option 16A/Option 14 and Option 11.

16.2.14 The overall value of the arboricultural resource which is likely to be affected is considered to be low/moderate. The magnitude of impact during and immediately post-construction is likely to be medium adverse, however, this will be mitigated over time by planting, which is anticipated to have a medium beneficial effect. The overall long-term arboricultural effect of all options is therefore considered to be neutral on the basis that only predominately low quality trees will be affected and that an equal area of potentially more resilient trees will be planted, as mitigation, and will be established once construction is complete.

ECOLOGY AND NATURE CONSERVATION

16.2.15 The scheme option least likely to result in significant effects upon ecological features is Option 18, primarily due to the limited footprint located within the existing junction. While this option may have temporary effects associated with the removal of tree and shrub vegetation, measures to replace and enhance habitat would form part of the designs and avoid any permanent, adverse impacts upon ecological features.

16.2.16 Options 11, 14, 16A and 16B all require the removal of semi-natural habitat to the north of the existing roundabout and are in closer proximity to the River Itchen SAC and SSSI. Option 11 would have effects of greatest significance, reflecting damage to the integrity of Easton Down SINC, fragmentation of retained calcareous grassland habitat and the potential for effects upon habitat hydraulically connected to the River Itchen SAC and SSSI. Options 14, 16A and 16B require a smaller footprint, however still require land take encompassing habitat of nature conservation value at the County scale.

GEOLOGY AND SOILS

16.2.17 Option 18 is the least likely to result in significant effects on geology and soils as the extent of the earthworks and works within the River Itchen are minimal. Option 16B is considered to have the potential for the second least effects as it does not intend to disturb the Spitfire Link Landfill. Options 14 and 16A have the joint next most potential for adverse effects as they involve a similar degree of disturbance and excavation within the Spitfire Link Landfill. Option 11, is considered to pose the greatest risk of impacts occurring as it has the largest extent of earthworks and the requirement for works within the River Itchen.

MATERIALS

16.2.18 It has been predicted that Option 11 will likely have the largest impacts on materials due to its size, followed by 14, 16A and 16B. Option 18 will likely have the smallest impact on materials as it is the smallest option, however the likely impact of the options taken forward will be re-assessed in subsequent PCF Stages. Impacts to materials are expected to be reduced through mitigation measures such as the use of recycled materials and the implementation of a SWMP.

NOISE AND VIBRATION

16.2.19 Given the proximity of certain NSRs to M3 J9 and the scale and complexity of the works and associated construction traffic and traffic management, the potential for noise and vibration disruption during the construction phase cannot be discounted at this time, whichever option is constructed. The risk of significant construction noise and vibration effects on NSRs will be minimised by appropriate measures in the CEMP, which will be applied throughout the construction phase.

16.2.20 While there is potential for significant operational noise and vibration effects associated with all of the options. It is reasonable to assume that the potential for such effects would be greatest for Option 11 (the option with the most extensive changes and potential for varying traffic flows) and least for Option 18 (the option with the least extensive changes). Of those remaining, Options 14 and 16A would have greater potential to cause adverse noise and vibration effects compared to Option 16B. This is because the new links forming Options 14 and 16A take a more easterly line, bringing traffic closer to sensitive receptors located off Easton Lane, compared with Option 16B where the majority of works are contained within the narrow corridor formed by the existing M3 and A34.

16.2.21 The preliminary overall ranking for noise and vibration would be Option 11, 14, 16A, 16B and 18, with Option 11 having the greatest potential to cause adverse effects and Option 18 the least.

PEOPLE AND COMMUNITIES

16.2.22 Option 11 is likely to bring about the greatest level of disruption to People and Communities due to its magnitude in comparison to the other four options, but the overall effect of each option is minimal and as such it is difficult to differentiate between the five options in this context. Therefore, in order to rank the five options in terms of impact on People and Communities, the size of the proposed scheme has been utilised as the key determinate. The ranking for People and Communities is Option 11, 14, 16A, 16B and 18.

16.2.23 Option 11, is considered to have the greatest likelihood of resulting in adverse effects on the water environment. This is primarily due to Option 11 needing the largest scale of works as the proposed alignment is longer than the other options and the need for the alignment to cross the River Itchen in three locations (the other options do not cross the river). Given the National and European designations of the River Itchen, the crossing of the watercourse increases the risk of this option having significant effects to the surface water features within the study area. There is also the potential for adverse effects from direct migration of pollutants to the ground and the Principal Aquifer underlying the scheme. The need for the Option 11 alignment to cross the River Itchen may also result in additional impacts in terms of flood risk and on the river itself.

16.2.24 Options 14, 16A, 16B and 18 all have the potential to increase the risk of surface water and groundwater pollution, as well as increasing flood risk within the study area and to neighbouring areas; however these options do not cross the River Itchen and are therefore, anticipated to have a lower potential to result in adverse effects on the water environment. Option 14 is anticipated to have the next greatest potential for adverse effects after Option 11, as it will involve the next greatest extent of works. The potential pollution risks to surface water and groundwater bodies from the construction and operation of the highway alignment are therefore, greater than those for options 16A, 16B and 18. Option 16A is anticipated to have the next greatest potential for adverse effects on the water environment, again due to the scale of the extent of the works followed by Option 16B.

16.2.25 Option 18 is least likely to result in significant effects to the water environment due to the limited footprint located within the existing junction and because it requires the least structures and interventions. Furthermore, Option 18 is the only option that is not at risk of fluvial or surface water flooding and will therefore not impact on flood risk within the scheme area or surrounding study area.

16.2.26 The potential adverse effects associated with the construction of all scheme options will be mitigated through the implementation of a CEMP. Potential for residual effects is likely to remain for Options 11, 14, 16A and 16B given the potentially short distance of the highway drainage system to the River Itchen.

16.2.27 It is not possible to differentiate between the proposed options in relation to groundwater, based on the limited information that is currently available. If groundwater is intercepted by the scheme options, groundwater mitigation will be required. A detailed information gathering exercise will be completed at PCF Stage 2 in order to enable conceptualisation and assessment of the scheme options impact to the groundwater environment.

16.3 OVERALL RANKING OF THE OPTIONS

16.3.1 Table 16-1 summarises the potential impacts associated with each option during the construction phase assuming a suitable CEMP is implemented. Table 16-2 summarises the potential impacts associated with each option during the operational phase. Both tables use the 7 point scale from WebTAG, where large adverse is -3, large beneficial is 3, and neutral is 0 assuming normal mitigation measures. Where there are several different impacts arising from a DMRB topic, or the impacts affect different receptors to a differing degree, the score presents the worst case potential impact relating to that topic.

Table 16-1: Summary of the potential construction impacts of the options

This uses the 7 point scale from WebTAG, where large adverse is -3, large beneficial is 3, and neutral is 0 assuming implementation of described mitigation measures

DMRB TOPIC	IMPROVEMENT OPTIONS				
	11	14	16A	16B	18
Air Quality	-1	-1	-1	-1	-1
Cultural Heritage	-3	-2	-2	-2	0
Landscape	-1	-1	-1	-1	0
Landscape (Arboriculture)	-1	-1	-1	-1	-1
Nature Conservation	-3	-2	-2	-2	-1
Geology and Soils	-3	-2	-2	-2	-1
Materials	-3	-2	-2	-2	-1
Noise and Vibration	-1	-1	-1	-1	-1
People and Communities	-1	-1	-1	-1	-1
Road Drainage and Water Environment	-3	-2	-2	-2	-1
Road Drainage and Water Environment (Groundwater)	-3	-3	-3	-3	-3

Table 16-2: Summary of the potential operational impacts of the options

This uses the 7 point scale from WebTAG, where large adverse is -3, large beneficial is 3, and neutral is 0 assuming implementation of described mitigation measures

DMRB TOPIC	IMPROVEMENT OPTIONS				
	11	14	16A	16B	18
Air Quality	1	1	1	1	1
Cultural Heritage	0	0	0	0	0
Landscape	-1	-1	-1	-1	0
Landscape (Arboriculture)	0	0	0	0	0
Nature Conservation	-3	-1	-1	-1	-1
Geology and Soils	-2	-2	-2	-2	-2
Materials	0	0	0	0	0
Noise and Vibration	-1	-1	-1	0	0
People and Communities	-1	-1	-1	-1	-1
Road Drainage and Water Environment	-3	-3	-3	-3	-2
Road Drainage and Water Environment (Groundwater)	-3	-3	-3	-3	-3

17 GLOSSARY

AAWT	Annual Average Weekday Traffic
ADS	Archaeological Data Service
AEP	Annual Exceedance Probability
ALC	Agricultural Land Classification
AOD	Above Ordnance Datum
APIS	Air Pollution Information System
AQS	Air Quality Strategy
AQMA	Air Quality Management Area
BGS	British Geological Society
BMV	Best and Most Versatile
BPM	Best Practicable Means
BOA	Biodiversity Opportunity Areas
BS	British Standard
CIEEM	Chartered Institute for Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CRoW	Countryside and Rights of Way Act
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
D2AP	Dual All-Purpose carriageway
dB	Decibel
DCLG	Department for Communities and Local Government
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EcIA	Ecological Impact Assessment

EIA	Environmental Impact Assessment
END	Environmental Noise Directive
ESR	Environmental Study Report
EU	European Union
FRA	Flood Risk Assessment
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GDMS	Geotechnical Data Management System
HAWRAT	Highways Agency Water Risk Assessment Tool
HBIC	Hampshire Biodiversity Records Centre
HER	Historic Environment Record
HPI	Habitats of Principal Importance
IAN	Interim Advice Note
IAQM	Institute of Air Quality Management
IUCN	International Union for Conservation of Nature
IEA	Institute of Environmental Assessment
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
KPH	Kilometres Per Hour
LBAP	Local Biodiversity Action Plan
LBCA	Listed Buildings and Conservation Areas
LCA	Landscape Character Area
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
LNR	Local Nature Reserve
LWS	Local Wildlife Site
M3 J9	Junction 9 of the M3
MAFF	Ministry for Agriculture, Fisheries and Food
MAGIC	Multi Agency Geographic Information for the Countryside

MNR	Marine Nature Reserve
MT	Motorised Travellers
n/b	North-bound
N-dep	Nitrogen deposition rate
NCA	Natural Character Area
NERC	Natural Environment and Rural Communities
NIA	Noise Important Areas
NMU	Non-Motorised Users
NNR	National Nature Reserves
NOx	Oxides of nitrogen
NPPF	National Planning Policy Framework
NRMM	Non-Road Mobile Machinery
NSR	Noise sensitive receptor
OS	Ordnance Survey
PCF	Project Control Framework
PCM	Pollution Climate Mapping
PPV	Peak Particle Velocity
PRA	Preliminary Risk Assessment
PRoW	Public Right of Way
PSSR	Preliminary Sources Study Report
RBMP	River Basin Management Plan
RIP	Regional Investment Programme
RIS	Road Investment Strategy
RoWIP	Rights of Way Improvement Plan
s/b	South-bound
SAC	Special Area of Conservation
SINC	Sites of Importance for Nature Conservation
SDNP	South Downs National Park

SPA	Special Protection Area
SPZ	Source Protection Zone
SRN	Strategic Road Network
SSSI	Site of Special Scientific Interest
TPO	Tree Preservation Order
µg/m^3	Micrograms per cubic metre
WCC	Winchester City Council
WCA	Wildlife and Countryside Act
WFD	Water Framework Directive
WPZ	Water Protection Zone
WWF	World Wide Fund
ZVI	Zone of Visual Influence

Appendix A

FIGURES

Appendix B

TECHNICAL APPENDICES

APPENDIX 2.1: REGULATORY AND POLICY FRAMEWORK

REGULATORY AND POLICY FRAMEWORK

NATIONAL NETWORKS NATIONAL POLICY STATEMENT (2014)

The Government adopted the National Policy Statement for National Networks (Department for Transport, 2014), which sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projectss (NSIPs) on the national road and rail networks in England. The Secretary of State will use this NPS as the primary basis for making decisions on development consent applications for NSIPs in England.

The National Policy Statement (NPS) sets out the Governments position with regards to improvements on the highways network and indicates that improvements vital to alleviate congestion, particularly in the South East. Paragraph 2.17 states that:

> "*It is estimated that around 16% of all travel time in 2010 was spent delayed in traffic, and that congestion has significant economic costs: in 2010 the direct costs of congestion on the Strategic Road Network in England were estimated at £1.9 billion per annum.*"

The NPS indicates that all schemes should be subject to an options appraisal, and that this should consider viable modal alternatives and may also consider other options. Where schemes have been subject to full options appraisal in achieving their status within Road or Rail Investment Strategies, or other appropriate policies or investment plans, option testing need not be considered by the examining authority or the decision maker. For national road and rail schemes, proportionate option consideration of alternatives will have been undertaken as part of the investment decision making process.

ANY FURTHER SUPPORT OF GOVERNMENT POLICIES

There are several national policies and strategies which link to the rationale and context for promoting the M3 Junction 9 Improvement scheme. These include:

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The Government's National Planning Policy Framework (NPPF, 2012) emphasises the importance of rebalancing the transport system in favour of sustainable transport modes, whilst encouraging local authorities to plan proactively for the transport infrastructure necessary to support the growth of major generators of travel demand.

The scheme is fundamental to relieving pressure on Junction 9 of the M3. The scheme would contribute towards delivering a resilient transport network that is fit for supporting the planned commercial development areas that are directly or indirectly served by the M3 Junction 9.

LOCAL TRANSPORT WHITE PAPER: 'CREATING GROWTH, CUTTING CARBON: MAKING SUSTAINABLE LOCAL TRANSPORT HAPPEN' (JANUARY 2011)

The Government's priorities set out in this document are to:

- → Help create growth in the economy; and
- → Tackle climate change by cutting carbon emissions.

Consistent with the priorities set out in this document, the proposed scheme aims to reduce congestion experienced at M3 Junction 9 and enhance overall capacity.

CLIMATE CHANGE ACT (2008)

The Climate Change Act (2008) established a long-term framework to reduce the UK's greenhouse gas emissions by at least 80%, compared to the 1990 baseline, by 2050. In accordance with the 2011 Carbon Plan, the Government has enabled funds, through incentives such as the LSTF, to support the development of sustainable infrastructure in order to reduce carbon emissions and promote economic growth.

The scheme aims to facilitate the efficient movement of traffic at the Junction at a speed that is closer to the optimum speed for fuel economy and could therefore potentially reduce greenhouse gas emissions.

DEPARTMENT FOR TRANSPORT: 'ACTION FOR ROADS' (2013)

The Department for Transport's (DfT's) Command Paper 'Action for Roads' 2013 sets out its vision for the future of the road network and explains that Government is making a transformational investment in the road network to support the economy and the environment, and to build a network that is fit for the future.

The proposed scheme was announced within the Roads Investment Strategy (2015-2020) and the scheme is included in the Highways England Delivery Plan 2015 – 2020 which says that Highways England expect to make recommendations on the preferred routes for this scheme in 2017.

CHAPTER 5 - AIR QUALITY

NPPF

Paragraph 124 of the NPPF requires compliance with EU limit values or national objectives for pollutants, taking into account the presence of AQMAs and the cumulative impacts on air quality from individual sites in local areas. Paragraph 30 states encouragement should be given to solutions which support reductions in greenhouse gas emissions and reduce congestion.

NPSNN

Schemes that are likely to have significant air quality effects, and/or affect the UKs ability to comply with the Air Quality Directive, must have the impacts of the scheme assessed as part of the Environmental Statement (ES) (Paragraph 5.6). Paragraph 5.12 accords air quality considerations substantial weight where, after taking into account mitigation, a project would lead to a significant air quality impact in relation to EIA and/or where they lead to deterioration in air quality in a zone/agglomeration.

ROAD INVESTMENT STRATEGY POLICY PAPER

Highways England should work with its partners to make progress on reducing the negative impacts on air quality which will support wider Government initiatives targeted at improving air quality. It will also need to demonstrate that it is playing its part in helping reduce carbon dioxide, and other greenhouse gas emissions, in line with current and future government targets.

HIGHWAYS ENGLAND OPERATIONS METRICS MANUAL

Highways England has a Performance Indicator (PI) which requires it to measure 'Carbon dioxide equivalents associated with Highways England's activities', which would include construction of road schemes

CHAPTER 6 - CULTURAL HERITAGE

NATIONAL POLICY

Paragraph 128 of the NPPF requires an environmental assessment to describe the significance of any heritage asset affected by the proposal. Paragraph 129 requires the identification and assessment of the significance of any heritage asset affected by the proposal. Paragraph 132 requires significant weight to be given to the conservation of the asset and paragraph 134 notes that where development will lead to less than substantial harm to the significance of a designated heritage the harm should be weighed against the public benefits of the proposal.

Paragraph 5.126 of the NPSNN states that where the development is subject to EIA the applicant should undertake an assessment of any likely significant heritage impacts of the proposed scheme as part of the EIA and describe these in the ES. The applicant should describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the asset's importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum, the relevant Historic Environment Record (HER) should have been consulted and the heritage assets assessed using appropriate expertise.

LOCAL POLICY

The relevant policies of the Winchester District Local Plan are summarised below:

Policy CP20 – Heritage and Landscape Character

'The Local Planning Authority will continue to conserve and enhance the historic environment through the preparation of Conservation Area Appraisals and Management Plans and/or other strategies, and will support new development which recognises, protects and enhances the District's distinctive landscape and heritage assets and their settings. These may be designated or undesignated and include natural and man made assets associated with existing landscape and townscape character, conservation areas, scheduled monuments, historic parks and gardens, listed buildings, historic battlefields and archaeology.

Particular emphasis should be given to conserving:

- → Recognised built form and designed or natural landscapes that include features and elements of natural beauty, cultural or historic importance
- → Local distinctiveness, especially in terms of characteristic materials, trees, built form and layout, tranquillity, sense of place and setting'

Policy HE.1

'Where important archaeological sites, monuments (whether above or below ground), historic buildings and landscape features, and their settings (as identified and recorded in the Sites & Monuments Record), whether scheduled or not, are affected by development proposals, permission will not be granted for development unless the Local Planning Authority is satisfied that, where appropriate, adequate provision has been made for their preservation in situ and on-going management, conservation and protection.

Where such preservation is not possible or desirable, the Local Planning Authority will permit development to take place only where satisfactory provision has been made for a programme of archaeological investigation, excavation and recording before, or during, development and for the subsequent publication of any findings, where appropriate.'

Policy HE.2

‘Where there is evidence that archaeological sites, monuments (whether above or below ground), historic buildings and landscape features, and their settings may be present on a site, but their extent and importance is unknown, the Local Planning Authority will refuse applications which are not supported by adequate archaeological assessment which clarifies the importance of the feature and demonstrates the impact of development.’

Policy HE.4

‘New development which would detract from the immediate or wider landscape setting of any part of a Conservation Area will not be permitted. Particular attention should be paid to conserving attractive views out of and into the area, including those from more distant/higher vantage points. Opportunities should be taken to improve views that detract from the appearance of the area.’

CHAPTER 7 - LANDSCAPE AND ARBORICULTURE

National Parks in England and Wales fall into Category V - Protected Landscapes, which are defined by IUCN as, "A protected area where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value, and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.”

The European Landscape Convention (Council of Europe, 2000) defines 'Landscape' as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors." It recognises that all landscapes are potentially important, irrespective of location or condition and should be considered in any assessment of effects.

NATIONAL POLICY AND LEGISLATION

The NPPF (2013) makes reference to valued landscapes and in particular those protected by designations such as those within National Parks and AONBs. It recognises Landscape as being an important part of sustainable development and in particular its environmental role as a contributing factor in understanding the natural, built and historic environment. Great importance is attached to the design of the built environment and the need for good design which should contribute positively to making better places for people.

The NPPF notes the importance of tranquillity and requires planning policies and decisions aim to "identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason”.

The NN NPS provides landscape guidance for development within nationally designated areas and requires great weight to be given to conserving landscape and scenic beauty, noting a strong presumption against any significant road widening within such areas. Impacts on nationally designated areas must be considered, even when the scheme falls outside of their boundaries. “The aim should be to avoid compromising the purposes of designation and such projects should be designed sensitively given the various siting, operational and other relevant constraints". If undertaking works in relation to, or so as to affect land in a National Park or AONB, it would need to comply with the respective duties in Section 11A of the National Parks and Access to Countryside Act 1949 and Section 85 of the Countryside and Rights of Way (CRoW) Act 2000.

The NN NPS requires that adverse landscape and visual effects be minimised through the appropriate siting of infrastructure, design (including choice of materials) and landscaping schemes.

SOUTH DOWNS NATIONAL PARK

The SDNP has been designated for its outstanding landscapes and its rich variety of landscape character. Under the Environment Act 1995 a National Park Authority is required to ensure:

- The conservation and enhancement of the natural beauty, wildlife and cultural heritage of the National Park
- The promotion of opportunities for the understanding and enjoyment of the National Park's special qualities by the public

The South Downs Partnership Management Plan (SDPMP), 2014-2019, which provides the starting point for the development of Local Plan is due for publication in October 2016. The following General Policies in the SDPMP are relevant to the scheme:

- The objective of General Policy 1 is to, "Conserve and enhance the natural beauty and special qualities of the landscape and its setting, in ways that allow it to continue to evolve and become more resilient to the impacts of climate change and other pressures."
- General Policy 3 is intended to "Protect and enhance tranquillity and dark night skies."
- General Policy 40 seeks to "Manage the highway network and its infrastructure to integrate it more effectively into the landscape and reduce the impact of traffic on communities and visitors"

LOCAL POLICY

The Winchester Local Plan Part 1- Joint Core Strategy Adopted 2013 includes Policy CP20: Heritage and Landscape Character. The policy wording concerning levels of tranquillity is perhaps the most pertinent to this appraisal given that there is generally a risk that highways projects can decrease tranquillity levels, particularly during construction. The WebTAG landscape impacts worksheets include specific appraisals of the effects on tranquillity for each option as well as the mitigation required to neutralise any adverse effects

CHAPTER 8 - NATURE CONSERVATION

The assessment of ecological impacts during the ESR has been undertaken with regard for the following guidance:

- Chartered Institute of Ecology and Environmental Management (CIEEM) (2016) Guidelines for Ecological Impact Assessment
- Highways Agency (2001) Design Manual for Roads and Bridges (DMRB) Volume 10 Section 4 Nature Conservation:
  - Part 1 HA 84/01 Nature Conservation and Biodiversity
  - Part 2 HA 59/92 Mitigating Against Effects on Badgers
  - Part 3 HA 80/99 Nature Conservation Advice in Relation to Bats
  - Part 4 HA 81/99 Nature Conservation Advice in Relation to Otters
  - Part 6 HA 98/01 Nature Conservation Advice in Relation to Amphibians
  - Part 7 HA 116/05 Nature Conservation Advice in Relation to Reptiles and Roads
- Highways Agency (2008) DMRB Volume 11 Section 2 Part 5 Assessment and Management of Environmental Effects
- Highways Agency (1993) DMRB Volume 11 Section 3 Part 4 Ecology and Nature Conservation
- Highway Agency (2009) DMRB Volume 11 Section 4 Part 1: Environmental Assessment: Assessment of Implications of European Sites

- Highways Agency (October 2015) Interim Advice Note (IAN) 125/15 Environmental Assessment Update
- Highways Agency (Sept 2010) IAN 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment

The regulatory framework of relevance for this ecological assessment comprises:

- The Conservation of Habitats and Species Regulations 2010 (as amended)
- The Wildlife and Countryside Act 1981 (as amended)
- The Natural Environment and Rural Communities Act 2006
- The Protection of Badgers Act 1992

CHAPTER 9 - GEOLOGY AND SOILS

The planning policy documents and the legislative context in relation to the assessment of the environmental effects on the geology and soils are set out below in sections covering European, UK, National and Local Level policies. The list is not intended to be exhaustive but includes the main documents relating to the protection, preservation and, where appropriate, enhancement of the geological environment.

EUROPEAN LEGISLATION & POLICY

The EU Directives and guidance of particular relevance to the scheme with respect to geology and soils are listed below:

- Water Framework Directive (2000/60/EC)
- Groundwater Directive (2006/118/EC)
- EU Thematic Strategy on Soils Protection 2006
- Waste Framework Directive 2008

NATIONAL LEGISLATION & POLICY

- National Planning Policy Framework, Department for Communities and Local Government, March 2012
- The Contaminated Land (England) (Amendment) Regulations 2012
- Contaminated Land Statutory Guidance, Department for Environment, Food and Rural Affairs, April 2012
- Environmental Protection Act 1990
- Water Resources Act 1991 (SI 57) (as partly amended by the Water Act 2003)
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (SI 2003/3243)
- The Landfill (England and Wales) Regulations 2000

LOCAL PLANNING POLICY

The Hampshire Minerals and Waste Plan 2013 (HMWP): Policy 15 (Safeguarding - mineral resources) of the HMWP provides the policy framework for mineral resource safeguarding in Hampshire.

ADDITIONAL GUIDANCE

Further guidance documents relevant to geology, soils and contaminated land have been considered when completing this assessment:

- Design Manual for Roads and Bridges (DMRB) Volume 4, Section 2, HD22/08, Managing Geotechnical Risks, August 2008
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5 Assessment and Management of Environmental Effects, August 2008
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11 Geology and Soils, June 1993
- Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D Publication 66. Environment Agency / National House-Building Council (NHBC). Volume 1. 2008
- Contaminated Land Report (CLR) 11: Model Procedures for the Management of Land Contamination (Environment Agency and Defra 2004)
- Department for Transport, National Policy Statement for National Networks, December 2014
- Contaminated Land Risk Assessment, A guide to good practice, CIRIA C552, 2001

CHAPTER 10 – MATERIALS

The EU Waste Framework Directive (2008/98/EC) provides an overarching legislative framework for the collection, transportation, recovery and disposal of waste. It explicitly set a target for recycling/reuse of 70% for construction, demolition and excavation wastes by 2020. This requirement has been implemented in England through the Waste (England and Wales) Regulations 2011.

In addition, the following legislative instruments in the UK govern the storage, collection, treatment and disposal of waste:

- The Control of Pollution Act 1974
- The Control of Pollution (Amendment) Act 1989
- Environmental Protection Act 1990 (EPA)
- The Environment Act 1995
- The Finance Act 1996
- Waste Minimisation Act 1998
- The Waste and Emissions Trading Act 2003
- The Clean Neighbourhoods and Environment Act 2005
- The Waste (England and Wales) (Amendment) Regulations 2012 and 2014

NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS (NN NPS)

The NN NPS requires that if a project is categorised as a Nationally Significant Infrastructure Project (NSIP) evidence of appropriate mitigation measures (incorporating engineering plans on

configuration and layout, and use of materials) during both design and construction needs to be presented together with the arrangements for managing any wastes that are produced.

Some of the scheme options proposed are likely to be considered an NSIP due to their scale and will therefore be required to be compliant with the NN NPS.

WASTE MANAGEMENT PLAN FOR ENGLAND (2013)

The Waste Management Plan for England is a high level document which is non-site specific and provides an analysis of the current waste management situation in England. It provides a planning framework to enable local authorities to put forward strategies that identify sites and areas suitable for new or enhanced waste management facilities to meet growing demand, through local waste management plans.

NATIONAL PLANNING POLICY FOR WASTE (OCTOBER 2014)

This document sets out detailed waste planning policies and states that all local authorities should have regard to its policies when discharging their responsibilities. The document provides guidance to local authorities on the following:

- Using a proportionate evidence base when preparing waste plans
- Identifying the need for waste management facilities
- Identifying suitable sites and areas for facilities
- How to determine waste planning applications

HAMPSHIRE MINERALS AND WASTE PLAN 2013 – 2030

The Hampshire Minerals & Waste Plan is the primary document for the management of materials and waste in the various administrative areas of Hampshire. The document sets out the long term spatial vision and strategy for sustainable minerals and waste development in Hampshire until 2030. The chosen M3 J9 scheme option should incorporate the requirements and goals of this plan in order to comply with Hampshire County Council's materials and waste goals.

The objective within Hampshire is to reuse, recycle and recover as much construction, demolition and excavation waste as possible generated within the county.

Policy 30: Construction, demolition and excavation (CDE) waste development states:

'Where there is a beneficial outcome from the use of inert CDE waste in developments, such as the restoration of mineral workings, landfill engineering, civil engineering and other infrastructure projects, the use will be supported provided that as far as reasonably practicable all materials capable of producing high quality recycled aggregates should have been removed for recycling.

Development to maximise the recovery of (CDE) waste to produce at least 1million tonne per annum of high quality recycled/secondary aggregates will be supported.'

CHAPTER 11 - NOISE AND VIBRATION

NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework (NPPF) was published in March 2012 and is a key part of the reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

The NPPF consolidates national planning policy guidance into one document, which replaces the previous Planning Policy Statements (PPSs) and Planning Policy Guidance Notes.

The main reference to noise within the NPPF is at paragraph 123, which is reproduced below:

"*123. Planning policies and decisions should aim to:*

- *avoid noise from giving rise to significant adverse impacts[27] on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts[27] on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;[28] and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The reference numbers 27 and 28 point respectively to the Explanatory Note to the Noise Policy Statement for England (NPSE) (see below) and the provisions of the Environmental Protection Act 1990 and other relevant law.

NOISE POLICY STATEMENT FOR ENGLAND

The Noise Policy Statement for England (NPSE) was published in March 2010. The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

> "*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*"

That vision is supported by the following aims which are reflected in the aims for planning policies and decisions in paragraph 123 of the NPPF:

> "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> - *avoid significant adverse impacts on health and quality of life;*
> - *mitigate and minimise adverse impacts on health and quality of life; and*
> - *where possible, contribute to the improvement of health and quality of life."*

NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS, 2014

The National Policy Statement for National Networks (NN NPS) provides advice on the content of a noise assessment for EIA where a development is likely to result in significant noise impacts. It also requires, where appropriate, consideration of the potential for noise impacts that are directly

associated with the proposed development, but occur outwith the immediate vicinity, such as changes in the road traffic movements elsewhere on the road network.

The NN NPS states that where a development is subject to an EIA and significant noise impacts are likely to arise, the applicant should include the following:

- a description of noise sources including likely usage (i.e. movements, fleet mix and diurnal pattern)
- identification of noise sensitive premises and noise sensitive areas that may be affected
- characteristics of the existing noise environment
- a prediction of how the noise environment will change with the proposed development
- an assessment of the effect of predicted changes in the noise environment on any noise sensitive areas
- mitigation measures, using best available techniques to reduce the noise impact
- the nature and extent of the noise assessment should be proportionate to the likely noise impact

Operational noise with respect to humans should be assessed using the principles contained in relevant British Standards and other guidance. The prediction of road traffic noise should be undertaken using the CRTN (see below).

CONTROL OF POLLUTION ACT, 1974

Sections 60 and 61 of Part III of the Control of Pollution Act (CoPA) provide the local authority with certain powers for controlling noise and vibration arising from construction (and demolition) works, whether a statutory nuisance has been caused or is likely to be caused. These powers may be exercised either before works start or after they have started.

Section 60 enables a local authority to serve a notice of its requirements for the control of noise on the person who is, or will be, carrying out the work. Section 61 provides a mechanism for the person who will be carrying out the work to take the initiative and approach the local authority to ascertain its noise requirements before construction work starts. Best Practicable Means (BPM) is defined in Section 72.

NOISE INSULATION REGULATIONS 1975, AS AMENDED 1988

The Noise Insulation Regulations (NIR) 1975, amended 1988, provide a framework for determining the entitlement to noise insulation treatment at eligible buildings (i.e. dwellings and other buildings used for residential purposes within 300m of the nearest point on the new or altered highway). The following three conditions should be met for the Regulations to apply:

- the combined expected maximum noise traffic level, i.e. the relevant noise level from the new or altered highway together with any other traffic in the vicinity must not be less than the specified noise level, $L_{A10,18h}$ 68 dB
- the relevant noise level is at least 1.0 dB(A) more than the prevailing noise level, i.e. the total traffic existing before the works to construct or improve the highway were begun
- the contribution to the increase in the relevant noise level from the new or altered highway must be at least 1.0 dB(A)

The noise should be predicted using the CRTN (see below) at a reception point located 1m in front of the most exposed part of an external window or door of an eligible room. Traffic flows

used in the calculations should be the maximum expected in a period of 15 years after opening to traffic. The predictions will be normally undertaken using the AAWT flows.

ENVIRONMENTAL NOISE DIRECTIVE, 2002

EU Directive 2002/49/EC relates to the assessment and management of environmental noise, and it is normally referred to as the Environmental Noise Directive (END). It promotes the implementation of three steps:

- undertake strategic noise mapping to determine exposure to environmental noise
- ensure information on environmental noise is made available to the public
- establish Action Plans based on the strategic noise mapping results, to reduce environmental noise where necessary, and to preserve environmental noise quality where it is good

The END has been transposed into UK law as the Environmental Noise (England) Regulations 2006 (as amended). As part of this process, noise mapping has been undertaken and NIAs have been identified.

CALCULATION OF ROAD TRAFFIC NOISE, 1988

This memorandum describes the procedures for calculating noise from road traffic. It provides a general method for predicting noise levels at a distance from a highway, taking into account different traffic parameters, intervening ground cover, road configuration and site layout. The procedures and requirements to be met during site measurements are detailed, together with details of a simplified measurement procedure which is acceptable in certain circumstances.

DESIGN MANUAL FOR ROADS AND BRIDGES, VOLUME 11, SECTION 3, 2011

DMRB, Volume 11, Section 3, Part 7, Noise and Vibration (HD213/11) advises on the assessment of noise and vibration for road schemes.

The procedure for impact assessment involves three levels: a) Scoping, b) Simple and c) Detailed. Selecting the appropriate level of assessment depends on the following threshold criteria:

- permanent change in magnitude of 1 dB(A) in the short term (i.e. on opening)
- permanent change in magnitude of 3 dB(A) in the long term (i.e. between opening and future assessment years)
- the predicted noise level during night-time $L_{night,outside}$ is greater than 55 dB in any scenario. The night-time noise level will be calculated in line with the methodology prepared by TRL[35]

The assessment is based upon the criteria for short-term and long-term noise impacts outlined in Tables 3.1 and 3.2 of HD213/11. Based on these tables, a change in road traffic noise of 1 dB(A) in the short-term, when a scheme is opened, is the smallest considered perceptible. In the long-term, a 3 dB(A) change is considered perceptible.

BS 5228:2009+A1:2014

[35] *Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping*. TRL Limited. 2002.

BS 5228-1:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*', provides recommendations for basic methods of noise control relating to construction and open sites where activities and operations generate significant noise levels. The annexes provide, amongst other things, information on the following:

- relevant legislation (annex A)
- typical noise sources and advice on mitigating them (annex B)
- sound level data for use in the prediction methods described in the Standard (annex C and annex D)
- assessing the significance of noise effects (annex E)
- the estimation of noise levels (annex F)
- how to implement noise monitoring (annex G)

Annex E provides a discussion on the different approaches to the assessment of construction noise, giving consideration to absolute noise criteria (in section E2) and to two different approaches to setting criteria based on the pre-construction ambient noise level (in section E3). One of these, the 'ABC' method, is presented in the table below (Table E.1 in the BS). Three categories, A, B and C are described in terms of threshold noise levels for a daytime (07:00 to 19:00 weekdays, 07:00 to 1:00 Saturday), evening and weekend, and finally a night time period (23:00 to 07:00). If the construction noise level exceeds the relevant threshold level this is deemed a "*significant effect*".

BS 5228-2:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*' is a companion standard for Part 1, providing recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels. Amongst other things, the annexes provide information on the following:

- relevant legislation (annex A)
- assessing the significance of vibration effects (annex B)
- measured vibration levels for piling (annexes C and D)
- the prediction of vibration levels (annex E)

Assessment category and threshold value

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD	THRESHOLD VALUE, IN DECIBELS (dB $L_{Aeq,T}$)		
	CATEGORY A [A)]	CATEGORY B [B)]	CATEGORY C [C)]
Night-time (23:00 − 07:00)	45	50	55
Evenings and weekends [D)]	55	60	65
Daytime (07:00 − 19:00) and Saturdays (07:00 − 13:00)	65	70	75

NOTE 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the periods increases by more than 3 dB due to site noise.

NOTE 3 Applied to residential receptors only.

[A)] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these

	values.
B)	Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
C)	Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
D)	19:00–23:00 weekdays, 13:00–23:00 Saturdays and 07:00–23:00 Sundays.

CHAPTER 12 - PEOPLE AND COMMUNITIES

NATIONAL

NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS (NN NPS)

Depending on the scheme option chosen, it may be categorised as a Nationally Significant Infrastructure Project (NSIP) and require a Development Consent Order. The NN NPS identifies the government's objectives for the National Networks, and those relevant to MT and NMU include:

- → Support and improve journey quality, reliability and safety
- → Support the delivery of environmental goals and the move to a low carbon economy
- → Join up our communities and link effectively to each other

NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The NPPF sets out a number of 'Core Planning Principles' which are necessary to deliver sustainable development. One of the principles, most relevant to this chapter, emphasises the need to manage patterns of growth to make the fullest possible use of public transport, walking and cycling.

Section 4 of the NPPF sets out how transport should be considered within the context of planning decisions and sustainable development. The framework states that encouragement should be given to solutions that seek to reduce congestion and serve to facilitate the use of sustainable transport.

The NPPF also encourages development that exploits opportunities for sustainable transport, particularly by giving priority to pedestrian and cycle movements, and providing access to high quality public transport facilities. In addition, the NPPF encourages development that minimises conflict between vehicular traffic, and NMU's.

The NPPF further states that local authorities should 'develop strategies for the provision of viable infrastructure necessary to support sustainable development'.

THE COUNTRYSIDE AND RIGHTS OF WAY ACT 2000 (CROW ACT)

The CRoW Act regulates all PRoW and ensures access to them. It requires local highway authorities to publish a Rights of Way Improvement Plan (RoWIP), which should be reviewed every 10 years. The Act also obliges the highway authority to recognise the needs of the mobility impaired when undertaking improvements.

THE DISABILITY DISCRIMINATION ACT 1995 (AMENDED 2005)

This Act requires Design Organisations to ensure that, where possible, accessibility for disabled people is equal to that of any other NMU. Disabled people, defined as those having a range of physical, sensory or mental impairments, represent approximately 14% of the UK's population.

LOCAL

LOCAL PLAN PART 1 – JOINT CORE STRATEGY APODPTED 2013

Following consideration by the SDNP Authority and WCC, both planning authorities adopted the Winchester District Local Plan 1 – Joint Core Strategy Development Plan on 19 and 20 March 2013 respectively.

POLICY CP10: The Local Planning Authority will seek to reduce demands on the transport network, manage existing capacity efficiently and secure investment to make necessary improvements. Development should be located and designed to reduce the need to travel. The use of non-car modes particularly walking and cycling should be encouraged through travel plans, management and improvements to the existing network, and improvements to accommodate additional traffic should be undertaken (or funded) where necessary.

HAMPSHIRE LOCAL TRANSPORT PLAN 2011-2031

Hampshire County Council's Local Transport Plan (LTP) was formally approved at a full meeting of the County Council on 24 February 2011. The LTP builds on previous local transport plans and seeks to make improvements to the transport system which will benefit people living and working in Hampshire. It has been produced following extensive consultation with the public and strategic partners. On 6 May 2014 the Executive Member for Environment and Transport approved a rolled forward three year Implementation Plan as part of a process of annual review and revision which is carried out each spring.

TRANSPORT PRIORITIES

THEME A – SUPPORTING THE ECONOMY THROUGH RESILIENT HIGHWAYS:

- **Main Priority 1**: To support economic growth by ensuring the safety, soundness, and efficiency of the transport network in Hampshire
- **Main Priority 2**: Provide a safe, well-maintained, and more resilient road network in Hampshire as the basic transport infrastructure of the county on which all forms of transport directly or indirectly depend, and the key to continued causality reduction

THEME B – MANAGEMENT OF TRAFFIC

- **Main Priority 3**: Manage traffic to maximise the efficiency of existing network capacity, improving journey time reliability and reducing emissions, thereby supporting the efficient and sustainable movement of people and goods

TRANSPORT STRATEGY FOR CENTRAL HAMPSHIRE AND THE NEW FOREST

ROAD NETWORK

The County Council has identified the following potential options that could be considered for delivery in support of the highway network:

- Providing a well maintained, resilient highway network
- Over the longer term, with the Highways Agency (now Highways England) to explore scope for affordable and environmentally acceptable solutions to address congestion at Junction 9 of the M3

CHAPTER 13 - ROAD DRAINAGE AND THE WATER ENVIRONMENT

WATER FRAMEWORK DIRECTIVE

The overall objective of the WFD is to bring about the effective co-ordination of water environment policy and regulation across Europe. The main aims of the legislation are to ensure that all surface water and groundwater reach 'Good' status (in terms of ecological and chemical quality and water quantity, as appropriate), by 2015 for cycle 1 and by 2027 for cycle 2; and promote sustainable water use, reduce pollution and contribute to the mitigation of flood and drought.

The WFD also contains provisions for controlling discharges of dangerous substances to surface waters and groundwater and includes a 'List of Priority Substances'. Various substances are listed as either List I or List II substances, with List I substances considered the most harmful to human health and the aquatic environment. The purpose of the directive is to eliminate pollution from List I substances and reduce pollution from List II substances.

GROUNDWATER DIRECTIVE (2006/118/EC)

This Groundwater Directive aims to set groundwater quality standards and introduce measures to prevent or limit pollution of groundwater, including those listed with the 'List of Priority Substances'. The directive has been developed in response to the requirements of Article 17 of the WFD, specifically the assessment of chemical status of groundwater and objectives to achieve 'good' status.

The Groundwater (England and Wales) Regulations 2009 - transposed certain elements of the Water Framework Directive, as they relate to groundwater and Article 6 of 2006 Groundwater Daughter Directive (2006/118/EC). The regulations are an environmental protection measure which provides enhanced protection for groundwater by preventing the input of '*hazardous*' substances into groundwater and limiting the input of '*non-hazardous*' pollutants into groundwater.

FLOODS DIRECTIVE (2007/60/EC)

The key objective of the Floods Directive is to coordinate the assessment and management of flood risk within Member States. Specifically it requires Member States to assess if all watercourses and coast lines are at risk from flooding, map the flood extent and assets and humans at risk in these areas and take adequate and coordinated measures to reduce this flood risk. The directive also reinforces the rights of the public to access this information and to have a say in the planning process.

NATIONAL POLICY

NATIONAL PLANNING POLICY FRAMEWORK

The NPPF sets out the Government's planning policies for England and provides a framework within which local councils can produce their own plans that better reflect the specific needs of their communities. Planning Practice Guidance 'Flood Risk and Coastal Change' has been published alongside the NPPF to set out how policies relating to flood risk, should be implemented.

The NPPF and Planning Practice Guidance 'Flood Risk and Coastal Change' identify how new developments must take into account flood risks, including making allowance for climate change impacts. Paragraph 100 of the NPPF requires that inappropriate developments in areas of flood risk should be avoided by directing development away from high risk areas. When development is necessary, projects should look to make schemes safe without increasing flood risk elsewhere. The sequential test is used as the principal step to identify preferred locations, i.e. those not exposed to risk of flooding. Then, if development is deemed necessary in a flood zone, an exception test can be conducted through an appraisal of risk, and appropriate reduction and management measures can be implemented.

All applications in the following areas should be accompanied by a Flood Risk Assessment (FRA):

- all projects in Flood Zones 2 and 3 (medium and high probability of river and tidal flooding)
- projects of 1ha or greater in Flood Zone 1 (low probability of river and tidal flooding)
- projects which may be at significant risk from other sources of flooding (local watercourses, surface water, groundwater or reservoirs)
- where the Environment Agency has notified the local planning authority that there are critical drainage problems

NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS

Paragraph 5.96 of the National Networks National Policy Statement advises applicants for projects that may be affected by or may add to flood risk to seek sufficiently early pre-application discussions with the Environment Agency, and other relevant flood risk management bodies. Examples of other flood risk management bodies are Lead Local Flood Authorities (LLFAs), Internal Drainage Boards (IDBs), sewerage undertakers, highways authorities, and reservoir owners and operators. Paragraph 5.97 continues to state that surface water flood issues need to be understood and then account of these issues can be taken.

ENVIRONMENTAL PERMITTING (ENGLAND AND WALES) REGULATIONS 2010

The Environmental Permitting (England and Wales) Regulations 2010 replaced the Water Resources Act 1991 as the key legislation for control of water pollution in the UK. Under the Environmental Permitting Regulations it is an offence to cause or knowingly permit a water discharge activity. This includes the discharge of polluting materials to freshwater, coastal waters, relevant territorial waters or groundwater unless complying with an exemption or an environmental permit. An environmental permit is obtained from the Environment Agency. The Environment Agency sets conditions which may control volumes and concentrations of particular substances or impose broader controls on the nature of the effluent, taking into account any relevant water quality standards from European Commission Directives.

ENVIRONMENT AGENCY GROUNDWATER PROTECTION: POLICY AND PRACTICE (GP3)

The Environment Agency is the statutory body responsible for the protection and management of groundwater resources in England. This document sets out the framework for Environment Agency regulation; Part 4 of the document, Legislation and Policies, is of key importance to development proposals. In summary, Part 4 sets out i) the key groundwater legislation and how this is interpreted by the Environment Agency and ii) the Environment Agency 's policy on activities that pose a risk to groundwater and how the Environment Agency will respond to activities and proposals.

LOCAL POLICY

WINCHESTER CITY COUNCIL LOCAL PLAN PART 1- JOINT CORE STRATEGY (2013)

The Winchester City Council Local Plan Part 1 – Joint Core Strategy includes a policy relating to the management of flood risk and surface water runoff which is therefore relevant to this scheme. This policy is summarised below:

Policy CP17 - Flooding, Flood Risk and the Water Environment: The policy sets out how flood risk should be avoided for new and re-development and promotes the use of Sustainable Drainage Systems (SuDS). The policy also promotes measures to reduce or avoid water contamination, improve water quality wherever possible and optimise water efficiency.

APPENDIX 6.1: HERITAGE ASSETS

The heritage assets are detailed in the tables below. Figures 6.1 to 6.3 show the assets in relation to the scheme area.

Designated assets (excluding Grade II listed buildings) within the 1km study area

HER REFERENCE	DESIGNATION	NAME
DWC35	Scheduled Monument	Site of St Gertrude's Chapel
DWC2056	Scheduled Monument	Iron Age field system, banjo enclosure and Romano-British villa 500m east of Woodham Farm
DWC2098	Scheduled Monument	Round barrow cemetery on Magdalen Hill Down
DWC27	Scheduled Monument	Anglo-Saxon cemetery in Worthy Park
DWC2128	Grade I listed	Church of St Mary, Easton
DWC2513	Grade I listed	Church of St Swithin
DWC2235	Grade II* listed	St Peters Theatre
DWC2251	Grade II* listed	1 Chesil Street
DWC2256	Grade II* listed	Winchester City Mill
DWC2297	Grade II* listed	Church of St John the Baptist
DWC2338	Grade II* listed	24 St John's Street
DWC2339	Grade II* listed	25 St John's Street
DWC2345	Grade II* listed	St John's Croft
DWC2346	Grade II* listed	35 St John's Street
DWC2349	Grade II* listed	34 St John's Street
DWC2130	Grade II* listed	Church of St Mary
DWC2698	Grade II* listed	Worthy Park House
DWC3773	Grade II* listed	Dymoke House
	Conservation Area	Winchester Conservation Area
	Conservation Area	Abbots Worthy Conservation Area
	Conservation Area	Kings Worthy Conservation Area
	Conservation Area	Easton Conservation Area

Grade II listed buildings within the 1km study area

HER REFERENCE	NAME
DWC2246	6 Chesil Street
DWC2278	52 St John's Street

HER REFERENCE	NAME
DWC2280	51 St John's Street
DWC2282	50 St John's Street

HER REFERENCE	NAME
DWC4030	The Cottage
DWC4031	The Cranny
DWC4033	The Elms
DWC3749	The Hurst
DWC3750	The Manor House
DWC3753	The Old Cottage
DWC3756	The Old Rectory
DWC4865	Old Farm Cottages
DWC2364	Rosemary Close
DWC2386	53 Wales Street
DWC2387	55 Wales Street
DWC2388	57 Wales Street
DWC3980	Pudding Farmhouse
DWC3982	Ramblers
DWC3983	Rosebank
DWC4018	Stable Block 20m NW of Kings Worthy Grove
DWC4019	Stable Block 25m NE of Worthy Park
DWC4023	Tavern Cottage
DWC4025	Thatched Cottage
DWC3763	Tudor Cottage
DWC3765	Vergers Cottage
DWC2364	Rosemary Close
DWC2123	Lower Farmhouse
DWC2125	Dymoke House, Boundary Wall
DWC2132	The Cart & Horses Public House
DWC3142	First in Last Out Public House
DWC3150	Garden Wall of St Johns Croft
DWC3933	Briar Cottage
DWC3921	Barn 20m NE of Pudding Farmhouse

HER REFERENCE	NAME
DWC3925	Barn at Abbots Worthy Mill
DWC2819	17 Chesil Street
DWC2820	19 Chesil Street
DWC2821	21 Chesil Street
DWC2822	23 Chesil Street
DWC2980	4 Bridge Street
DWC3893	1 Mill Lane
DWC3178	Stable Block of St Johns Croft
DWC2823	25 Chesil Street
DWC2824	27 Chesil Street
DWC2825	3 Chesil Street
DWC2927	21 St John's Street
DWC2930	22 St John's Street
DWC3235	The Old Post Office
DWC3239	Laundry Cottage
DWC3240	Upper Farmhouse
DWC3774	East View
DWC3186	The Rising Sun Public House
DWC3784	Granary 15m N of Lower Farmhouse
DWC4863	North and north-east Boundary Wall and Gatepiers at Abbots
DWC3970	Old School House
DWC3971	Old Thatch
DWC3807	Weald Cottage
DWC3808	Well Cottage
DWC3810	Wisteria
DWC3146	Garden House at St Johns Croft
DWC4938	Kitchen garden wall and adjoining melon/mushroom house, formerly
DWC3895	12 Church Lane
DWC3898	2 Mill Lane

HER REFERENCE	NAME
DWC3901	3 Mill Lane
DWC3910	6 Mill Lane
DWC3913	7 Mill Lane
DWC3915	Abbots Worthy Mill
DWC3920	Barn 15m NW of Upper Farmhouse
DWC3798	Jessamine
DWC3800	Keepers Cottage
DWC3801	Kingsworthy Antiques

HER REFERENCE	NAME
DWC3802	Kingsworthy Grove
DWC3955	Lych Gate 85m S of Church
DWC3963	Mill House
DWC3903	3 Tombchests in St Marys Churchyard
DWC3904	3 Tombchests S & E of Church of St Mary
DWC2248	4 Chesil Street

Historic Water Meadows within the 1km Study Area

HER REFERENCE	DESCRIPTION
194	In 1996: Head Main/main drains extant. Carriers survive as earthworks in west and east (50%). Woodland covers 30% of meadow.
196	In 1996: Head Main visible as faint earthwork; main drain extant (wooded).
195	In 1996: well-preserved carriers over 80% of meadow.
198	In 1996: Head main/main drains visible as faint earthworks.
197	In 1996: combination of arable cultivation in north and quarrying in south (both pre-1971) has destroyed this meadow.
200	In1996: Head Mains and main drains survive as faint earthworks or wooded boundaries. West truncated by road.
201	In 1996: Head Main extant. No other traces of watermeadow visible.
203	In 1996: Head Main/main drain extant. Western half cut by post-1971 motorway and partly obscured by woodland/scrub (30%).
202	In 1996: faint cropmarks of carriers. Western half severed by post-1971 motorway.
199	In 1996: Head Main/main drains visible as faint earthworks. Woodland covers west side (30%).

Locally listed parks and gardens in the 1km study area

HER REFERENCE	DESCRIPTION
Hinton House	Private garden on the local register
Kings Worthy Court	A post-1810 park with 20th century redevelopment. Only the garden/ perimeter walls remain.
Headbourne Worthy Grange	A private garden on the local register
Upper Farm	A private garden on the local register
Kings Worthy Grove	A small 20th century restored villa landscape.
Kings Worthy House	A post-1810 park of a now demolished house. The unmanaged gardens remain.

HER REFERENCE	DESCRIPTION
Northleigh	A Victorian formal garden
Abbotsworthy House	A post-1810 park on the local register
Worthy Park	A deer park and pre-1810 park. A sub-division of ownerships has occurred during the 20th century.
St. Giles Hill	Public pleasure grounds
Morton House	A private garden, redevelopment has affected the historic value.

Non-designated heritage assets within the 300m study area

HER REFERENCE	NAME	DESCRIPTION	HISTORICAL PERIOD
MWC1135	Enclosure Site/1976-7	Ring Ditch	Iron Age
MWC1136	Enclosure Site/1976-7	Ditched Enclosure	Iron Age
MWC1137	Enclosure Site/1976-7	Post-hole	Iron Age
MWC1138	Enclosure Site/1976-7	Find Spot – Iron Sickle	Iron Age
MWC1139	Enclosure Site/1976-7	Faunal Assemblage	Iron Age
MWC1140	Enclosure Site/1976-7	Ceramic Assemblage	Iron Age
MWC1141	Enclosure Site/1976-7	Findspot	Iron Age
MWC1142	Enclosure Site/1976-7	Findspot	Iron Age
MWC1143	Enclosure site/1976-7	Enclosure	Iron Age
MWC1144	Enclosure site/1976-7	Findspot	Iron Age
MWC1145	Enclosure site/1976-7	Findspot	Bronze Age
MWC1146	Enclosure site/1976-7	Findspot	Iron Age
MWC1167	Sub-circular crop mark enclosure on Winnall Down (Winnall Down II)	Enclosure with some evidence of occupation	Iron Age
MWC1876	Didcot, Newbury and Southampton Railway	Former railway	Industrial
MWC1877	Didcot, Newbury and Southampton Railway	Former railway	Industrial
MWC1881	A33	Former railway bridge over road now route of A34	Modern
MWC1882	Kings Worthy Railway Station	Former railway station	Modern
MWC2296	The Didcot Newbury and Southampton Railway	Railway	Industrial
MWC2298	White Hall Cottage area	Large area of flint and dark clay	Unknown
MWC2299	Easton Down	Inhumation	Bronze Age
MWC2300	Easton Down	Pit	Iron Age
MWC2301	Easton Down	Cremation	Bronze Age
MWC2302	Easton Down	Faunal Assemblage	Iron Age
MWC2303	Easton Down	Ceramic Assemblage	Neolithic
MWC2304	Easton Down	Findspot	Bronze Age
MWC2305	Easton Down	Bronze knife-dagger	Bronze Age
MWC2306	Easton Down	Barrow	Bronze Age
MWC2307	Easton Down	Faunal Assemblage	Neolithic
MWC2308	Easton Down	Lithic Assemblage	Bronze Age
MWC2309	Easton Down	Ceramic Assemblage	Bronze Age

HER REFERENCE	NAME	DESCRIPTION	HISTORICAL PERIOD
MWC2310	Easton Down	Findspot	Bronze Age
MWC2311	Easton Down	Field System	Iron Age
MWC2312	Easton	Earthworks	Iron Age
MWC2313	Easton Down	Enclosure, possible Saxon Grubenhaus	Possibly early medieval
MWC2314	Manor Farm, Easton Down	Linear feature	Unknown date
MWC2315	Manor Farm	Round barrow	Bronze Age
MWC7208	Site of cottages	Site of cottages now lost or demolished	Post-medieval/Industrial
MWC7209	Possible early medieval cemetery site	Possible cemetery site evidenced through finds	Early medieval
MWC7210	Point in former parish boundary	Boundary Marker	Unknown
MWC2942	Kings Worthy	Royal Palace	Early Medieval
MWC2958	Wisteria London Road	Building	Post-medieval to Industrial
MWC2968	Abbotsworthy House	House	Modern
MWC2975	Fulling Mill, River Itchen	Site of watermill	Post-medieval to modern
MWC2976	Abbots Worthy	Deserted medieval settlement	Late medieval
MWC3058	Easton Down	Linear feature	Bronze Age
MWC5417	Extension to St Mary's Church, Kings Worthy, archaeological excavation	Yard/metalled surface	Unknown date
MWC6589	Middle to Late Bronze Age settlement and later remains	Settlement evidence	Bronze Age to Industrial
MWC4756	Geophysical survey, St. Mary's Church, Kings Worthy	Possible tomb	Unknown date
MWC4757	Geophysical survey, St. Mary's Church, Kings Worthy	Possible grave	Unknown
MWC4758	Evaluation at St. Mary's Church, Kings Worthy	Grave	Medieval
MWC4759	Evaluation at St. Mary's Church, Kings Worthy	Grave	Post-medieval
MWC4760	Evaluation at St. Mary's Church, Kings Worthy	Coffin fittings	Post-medieval
MWC4761	Evaluation at St. Mary's Church, Kings Worthy	Shroud pin	Post-medieval
MWC4762	Evaluation at St. Mary's Church, Kings Worthy	Ceramic assemblage	Roman
MWC4763	Evaluation at St. Mary's Church, Kings Worthy	Ceramic assemblage	Late medieval
MWC4764	Evaluation at St. Mary's Church, Kings Worthy	Ceramic assemblage	Post-medieval
MWC5474	Finds from reservoir cut, off Nuns Walk, Abbotts Barton	Ceramic assemblage	Roman
MWC5475	Finds from reservoir cut, off Nuns Walk, Abbotts Barton	Ceramic assemblage	Bronze Age
MWC5476	Finds from reservoir cut, off Nuns Walk, Abbotts Barton	Pot sherd	Neolithic
MWC5477	Finds from reservoir cut, off Nuns Walk, Abbotts Barton	Faunal assemblage	Unknown
MWC5478	Finds from reservoir cut, off Nuns Walk, Abbotts Barton	Worked flint	Unknown

HER REFERENCE	NAME	DESCRIPTION	HISTORICAL PERIOD
MWC5479	Finds from reservoir cut, off Nuns Walk, Abbotts Barton	Slag	Unknown
MWC5480	Finds from reservoir cut, off Nuns Walk, Abbotts Barton	Iron objects	Unknown
MWC552	Easton Down	Lynchets	Prehistoric
MWC553	Longwalk Itchen Valley	Field System	Prehistoric
MWC7237	Prehistoric ring ditch & linear feature	Ring ditch and linear feature	Prehistoric
MWC5934	Evaluation at Peek Management site, London Road, Kings Worthy	Ditch	Unknown
MWC5935	Evaluation at Peek Management site, London Road, Kings Worthy	Palaeochannel	Palaeolithic
MWC5936	Evaluation at Peek Management site, London Road, Kings Worthy	Flints and small pottery fragments	Prehistoric
MWC5937	Evaluation at Peek Management site, London Road, Kings Worthy	Flints and small pottery fragments	Prehistoric
MWC5938	Evaluation at Peek Management site, London Road, Kings Worthy	Pottery	Unknown
MWC7367	site of a group of cottages, Littleton.	Site of cottages, now demolished	Post-medieval to Industrial
MWC6180	Easton Down	Group record for MWC2299-MWC2310	Prehistoric settlement evidence
MWC6201	Easton Down	Group record for MWC552 and MWC3058	Prehistoric features
MWC6374	Finds from reservoir cut, off Nuns Walk, Abbotts Barton	Group record for MWC5474 – MWC5480	Prehistoric to Roman features and finds
MWC6469	Evaluation at Peek Management site, London Road, Kings Worthy	Group record for MWC5934-MWC5938	Palaeolithic and prehistoric dated features
MWC6485	Geophysical survey, St. Mary's Church, Kings Worthy	Group record for MWC4756-7	Possible graves identified during geophysical survey
MWC6486	Evaluation at St. Mary's Church, Kings Worthy	MWC4758 – MWC4764	Roman and Medieval settlement evidence
MWC6497	Cemetery At Winnall Industrial Estate North And South	Grave and two cremations	Bronze Age
MWC6504	Ditched Enclosure At Winnall Industrial Estate South And North	Ditched Enclosure	Roman
MWC6587	Hut Circle At Winnall Industrial Estate North	Hut Circle	Neolithic
MWC6588	Ring Ditch At Winnall Industrial Estate North	Ring ditch	Neolithic
MWC6591	Cemetery At Winnall Industrial Estate North And South	Cemetery	Bronze Age
MWC6592	Settlement At Winnall Industrial Estate North And South	Settlement	Middle Bronze Age
MWC6593	Settlement At Winnall Industrial Estate South	Settlement	Late Bronze Age
MWC6608	Settlement At Winnall Industrial Estate North And South	Settlement	Middle Bronze Age
MWC6609	Settlement At Winnall Industrial Estate South	Settlement	Early Iron Age
MWC6625	Winnall Saxon Cemetery	Inhumation Cemetery	Early Medieval
MWC6691	Ditched Enclosure At Winnall Industrial Estate South	Ditched enclosures with post-built timber buildings	Roman

HER REFERENCE	NAME	DESCRIPTION	HISTORICAL PERIOD
MWC6745	Ditched Enclosure At Winnall Industrial Estate North And South	Ditched enclosure	Early medieval
MWC6969	Undated feature, St Swithuns' School	Shallow cut feature	Unknown
MWC7966	War Memorial - Kings Worthy	War memorial	Modern
MWC8013	Possible long barrow at St Swithun's School, Alresford Road, Winchester	Possible long barrow	Neolithic

THE POTENTIAL FOR HITHERTO UNKNOWN BELOW-GROUND HERITAGE ASSETS WITHIN THE SCHEME AREA

Previous archaeological investigations and find spots within the 300m study area can often be a good indication of the type of archaeology that may survive within undisturbed ground within the proposed scheme Area. The table below presents a summary of archaeological potential by historical period.

The potential for hitherto known below-ground heritage assets

HISTORICAL PERIOD	DATE RANGE	POTENTIAL TO BE PRESENT
Prehistoric Period: **Palaeolithic** **Mesolithic** **Neolithic** **Bronze Age** **Iron Age**	500,000 – 10,000 BC 10,000 – 3,500 BC 3,500 – 2,200 BC 2,200 – 700 BC 700 BC – AD 43	There is extensive evidence for occupation of the scheme area in the prehistoric period. With several examples of field systems (MWC553) and prehistoric earthworks including lynchets on Easton Down (MWC552). Previous excavations include a Bronze age and Iron Age settlement (MWC1135-1146) recorded in the area of Junction 9 during the original M3 construction. With evidence of a Neolithic to Iron Age settlement, including cremation and inhumations, recorded as part of the same construction scheme further to the north (MWC6180). A number of Bronze Age funerary monuments, including a Scheduled Monument (DWC2098) also exist within the wider study area. Although these are more often located on or near to the peaks of ridges. There is a very high potential for previously unrecorded remains of this period, with the possibility that sites recorded as part of the original M3 construction may have continued into adjacent unexcavated areas.
Romano-British	AD 43 – AD 410	There is some evidence of settlement continuing into the Romano-British period, as shown at Woodham Farm (DWC2056) where an Iron Age enclosure and Romano-British villa exist contiguously. Additionally finds from the reservoir cut at Abbots Barton (MWC6374) suggest, if not continued occupation, a definite re-use of settlement sites. There is a moderate potential for previously unrecorded buried remains of this period within the scheme area.
Early Medieval (Anglo-Saxon and Viking periods)	AD 410 – AD 1066	Evidence for early medieval occupation exists across most of the study area. A programme of geophysical survey on Easton Down to the east has recorded buried features that have been interpreted as a potential Anglo-Saxon period Grubenhaus (MWC2313). It is also purported that Kings Worthy, at the north, was the site of an early medieval royal palace (MWC2942) which also suggests the potential for buried remains of this period. The presence of an early medieval cemetery at the southern

HISTORICAL PERIOD	DATE RANGE	POTENTIAL TO BE PRESENT
		extent of the scheme (MWC6625) has indicated a relatively lengthy period of use with further settlement enclosures recorded in the same vicinity (MWC6745). The potential for previously unrecorded buried remains of this period are high, and several of the options directly impact upon known remains.
Late Medieval	AD 1066 – AD 1540	Although evidence of the late medieval period is less prolific within the scheme area, examples in the wider study area include a deserted medieval village at Abbots Worthy (MWC2976) and the location of St. Gertrude's Chapel (DWC35), first mentioned in 1249, to the west of the River Itchen. There is moderate potential within the scheme area for previously unrecorded buried remains from this period.
Post-medieval	AD 1540 – *c*1750	The site of a post-medieval fulling mill (MWC2975) is located on the River Itchen and it is possible that the inception of the water meadows and water management systems also date to this period. Other examples of post-medieval assets in the study area include the site of a number of demolished cottages (MWC7367) and other residential buildings (MWC2958). There is a high potential for previously unrecorded buried remains from this period.
Industrial Period	*c*AD1750 – 1901	A number of the proposed options directly impact upon Industrial period remains associated with the former Didcot and Southampton railway. There is a moderate potential for other previously unrecorded buried remains of this period.
Modern	Post-1901	A number of the proposed options directly impact upon modern remains associated with the former Didcot and Southampton railway. There is a moderate potential for other previously unrecorded buried remains of this period.

APPENDIX 7.1
ARBORICULTURE ASSESSMENT

INTRODUCTION

This assessment provides a brief description and evaluation of the existing arboricultural resource within the vicinity of the proposed scheme options for improvements to the M3 at junction 9. It identifies the quality and value of the resource and any associated constraints. It also makes a preliminary assessment of potential effects associated with each of the scheme options described in Table 3-2.

Potential arboricultural effects have been considered where trees are likely to be directly influenced by each of the design options.

ASSESSMENT METHODOLOGY

The arboricultural effects of the scheme have been assessed as follows:

- Completion of a desk-based study in order to establish the baseline conditions within the study area to include an evaluation of the quality and value of the identified arboricultural features
- assessment of the proposed mitigation measures for each of the options and their potential to mitigate and adverse impacts
- assessment of the potential effects on the arboricultural resource arising from the construction and operation of each option

The quality and value of the existing arboricultural resource has been evaluated using street-view imagery. This methodology has significant limitations in terms of tree surveying as it precludes the detailed inspection of individual trees or groups of trees and provides only limited visual coverage across the study area. The quality and value categories assigned to the arboricultural resource must therefore be considered preliminary in nature and may be subject to change following a ground-based survey.

DESK-BASED STUDY

Preliminary baseline data was obtained from a desk-based study using the following data sources:

- Winchester City Council (www.winchester.gov.uk)
- MAGIC Website (www.magic.gov.uk)
- Woodland Trust – Ancient Tree Hunt Interactive Map (www.ancient-tree-hunt.org.uk)
- Google Earth Pro

Publically available information pertaining to statutory designations, habitat assessments and the presence of ancient, veteran and notable trees has been used to identify the possible occurrence of important trees. A combination of aerial photography and street level imagery has also been utilised as a means of confirming the extent of general tree cover and gaining a basic overview of its likely quality and value.

Limitations in the quality and coverage of street level imagery mean that whilst an indication as to the quality and value of groups of trees could be obtained this must be considered preliminary in nature and may be subject to change following any subsequent site visits and more detailed inspections.

Furthermore, areas where street level imagery is not available precluded the assessment of trees, groups and woodlands. This is because whilst their presence could be confirmed using aerial photography insufficient information was available to enable a preliminary assessment to be made of their quality or condition.

BASELINE CONDITIONS

STATUTORY DESIGNATIONS

Two separate Tree Preservation Orders (TPOs) were identified to the south of the study area. These include TPO 00039-2003-TPO which covers three separate groups of trees located immediately west of the M3 and south of Junction 9. Also included is TPO 00762-2003-TPO which covers a single linear group of trees located to the east of the M3 and some 225 metres north of the B3404 and running in an east-west direction.

In addition to the above, the Kingsworthy Conservation Area is located at the northern end of the study area. This provides statutory protection to all trees with a stem diameter in excess of 75mm and which are located north of the A33 Winchester By-Pass and east of Church Green Close.

MODERATE QUALITY TREES

A small group of moderate quality trees was identified at the northernmost tip of the study area, to the east of the A34 and either side of the B3047 London Road. These trees have been identified as moderate quality trees on the basis that they are likely to provide valuable screening between various residential properties and the adjacent A34.

LOW QUALITY TREES

Aside from the above all of the remaining trees located on either side of the M3, A33 and A34 have been identified as low quality specimens. This reflects the general absence of any identifiable trees of any great stature or age and is based upon the assumption that, were they to be removed, any associated amenity value could be replaced through suitable planting and within a reasonable period of time.

TREES WITH UNIDENTIFIABLE VALUE

A small number of trees could not be awarded a quality value. These are specimens which sit to the rear of the highways verge and cannot be seen using street level imagery. These trees are generally located in the V-shaped area of land between the M3 and the A34 or to the east of the M3 and west of Easton Lane.

Whilst insufficient information is available for these groups of trees to be awarded a quality value, their positioning along obviously established wooded areas and field boundaries means that there is a possibility that they may include moderate or high quality trees.

The overall extent and the quality and condition category of all trees likely to be affected by any of the options is shown in Figure 7.14.

ASH DIEBACK DISEASE

Given the prevalence of ash (*Fraxinus excelsior*) within the UK tree population it is likely that this will be a frequently occurring species of tree and is likely to be present in numbers throughout the study area.

Since 2012, these trees have been under threat from the fungal disease known as Ash dieback disease (*Hymenoscyphus fraxineus*). This disease has the potential to affect all ash trees and could result in varying degrees of leaf loss, crown dieback, bark lesions or even the death of the tree.

It is anticipated that, over time, the presence of Ash dieback disease will have a negative impact on the overall quality and value of the tree groups within the study area. The magnitude and duration of

this impact will be dependent on the ability of other tree species to propagate and grow, but is likely to be significant and will persist for many years.

REGULATORY AND POLICY FRAMEWORK

NATIONAL LEGISLATION & POLICY

The National Planning Policy Framework includes relevant guidance in chapter 11: Conserving and Enhancing the Natural Environment. Paragraph 118 of this chapter includes an expectation that planning permission should be refused where it results in the loss of ancient woodland and aged or veteran trees 'unless the need for, and benefits of, the development in that location clearly outweigh the loss'.

The Town and Country Planning Act 1990 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 where it is expedient in the interests of amenity to make provision for the preservation of trees and woodlands.

LOCAL POLICY

The Winchester District Local Plan Part 1 – Joint Core Strategy – Policy CP20 'Heritage and landscape Character' confirms that the Council will support development which recognises, protects and enhances the District's distinctive landscape and heritage assets and their settings. This includes the preservation of trees.

The Winchester District Local Plan Review (2006) Policy DP.4 confirms that development will be resisted where it results in the loss of trees and hedgerows. It also states that trees protected by Tree Preservation Order legislation or within a Conservation Area 'should be retained and not adversely affected by development'.

DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

DESIGN

Whilst the current options show the footprint of the various proposals they do not include details of the working space required to construct them. In addition, it is also unclear as to whether some of the embankments that are shown relate to proposed features or those which currently exist.

Careful consideration regarding additional land take during construction has the capacity to limit the overall area of tree removals whilst the exclusion of works from existing treed areas wherever possible will also assist in mitigating the arboricultural impact of the scheme options.

The location and purpose of any mitigatory planting should be identified at the earliest opportunity in PCF Stage 3 in order that the spatial and physiological requirements of trees can be accounted for in any future designs. All reasonable efforts should be made to avoid conflicts with items such as sightline, underground services and CCTV and to ensure that suitable growing conditions are provided through the provision of adequate space and soil.

MITIGATION

Details of appropriate mitigation and enhancement measures are provided as part of the 'Landscape and Visual Effects' assessment within this report and assume a net gain in overall woodland cover within the area of works.

Whilst this in itself is a positive factor it could be further enhanced by taking the opportunity to address potential future issues which exist with the current tree stock such as the use of alternative tree species to mitigate the effects of Ash dieback disease. The chance could also be taken to improve species diversity within the area as insurance against future outbreaks of pests and disease, and ensure the greater use of plants with an enhanced resilience to predicted climate change scenarios.

Any mitigatory planting should be viewed as an opportunity to build resilience into the local tree population and to ensure that it remains a sustainable resource over the longer term.

OVERALL ASSESSMENT

This assessment considers the potential arboricultural impacts that would arise from each of the proposed options. The overall significance of effect associated with each option has been determined in accordance with Section 4.4.

OPTION 11

Although approximately 10.5ha of trees may need to be removed in total it is probable that an equal or greater area of trees could be planted as mitigation. The majority of trees to be removed are low quality specimens with less than 1 hectare being either moderate quality or uncategorised.

If desired the small area of moderate quality trees which may be removed could be replaced with semi-mature specimens in order to provide adjacent residents with a degree of amenity value and screening. Whilst the areas of uncategorised trees which are shown to be removed may contain moderate or high quality trees, these are only partially accessible by the general public and any such removals will therefore have limited impact on public amenity.

The overall value of the arboricultural resource which is likely to be affected by this option is considered to be low/moderate. Whilst the magnitude of impact during and immediately post-construction is likely to be medium adverse this will be mitigated over time by the medium beneficial effects of mitigatory planting. The overall long-term arboricultural significance of this option is therefore considered to be neutral.

The overall extent and the quality and condition category of all trees likely to be affected by option 11 is shown in Figure 7.15

OPTIONS 14 AND 16A

These options require the removal of approximately 6.35ha and 4.32ha of trees respectively. In both instances the vast majority of trees which are to be removed are low quality specimens with very limited numbers of uncategorised trees likely to be affected. In each case, the small areas of uncategorised trees which will be removed are not publically accessible and, whilst they may contain moderate or high quality trees, their loss is unlikely to have any identifiable impact on public amenity.

The overall value of the arboricultural resource which is likely to be affected by these options is considered to be low. Whilst in both cases the magnitude of impact during and immediately post-construction is likely to be medium adverse this will be mitigated over time by the medium beneficial effects of mitigatory planting. The overall long-term arboricultural significance of these options is therefore considered to be neutral.

The overall extent and the quality and condition category of all trees likely to be affected by options 14 and 16A are shown in Figures 7.16 and 7.17 respectively.

OPTION 16B

This option requires the removal of the smallest area of trees at just 1.44ha. All of the trees to be removed are of low quality and it is anticipated that a similar or greater area of trees can be planted once the construction phase of the scheme is complete.

The overall value of the arboricultural resource which is likely to be affected by this option is considered to be low. Whilst the magnitude of impact during and immediately post-construction is likely to be low adverse this will be mitigated over time by the low beneficial effects of mitigatory planting. The overall long-term arboricultural significance of this option is therefore considered to be neutral.

The overall extent and the quality and condition category of all trees likely to be affected by option 16B is shown in Figure 7.18

OPTION 18

This option is likely to require the removal of just 1.8ha of low quality trees. Assuming that the area within the existing roundabout and the embankments associated with the new carriageway can be replanted then there is unlikely to be any significant reduction to the area currently occupied by trees.

The overall value of the arboricultural resource which is likely to be affected by this option is considered to be low. Whilst the magnitude of impact during and immediately post-construction is likely to be low adverse this will be mitigated over time by the low beneficial effects of mitigatory planting. The overall long-term arboricultural significance of this option is therefore considered to be neutral.

The overall extent and the quality and condition category of all trees likely to be affected by option 18 is shown in Figure 7.19.

With the exception of a small area of moderate quality trees which need to be removed to facilitate the construction of option 11 all other trees which are to be removed are low quality specimens. In this respect there is little difference in the impact associated with options 14, 16A, 16B and 18 other than the overall area of trees which are to be removed.

Whilst the overall significance of effect associated with each of the five options is neutral this relies upon any tree removals being mitigated by an equal area of replacement planting. Given that this replacement planting is likely to take a minimum of 15 years before it is sufficiently established for it to effectively offset any lost amenity this will result in adverse impacts in the short to medium term.

On this basis options 16B and 18 should be preferred as they each require the removal of only a relatively small area of established trees. These two options will therefore have the most limited impact on amenity during construction and the subsequent period of operation during which the replacement planting will establish and grow.

Conversely option 11 will result in the greatest adverse impact on amenity over the short to medium term. This is because it requires the largest area of tree removals and will therefore have the biggest effect during both construction and the period between planting and the trees reaching a semi-mature age. This will be further compounded by the removal of an area of moderate quality trees and the impact that this will have on residents living close to the northbound carriageway of the A34.Options 14 and 16A will have a lesser short to medium term adverse impact than option 11 both in terms of tree removal and geographical extent. Whilst both require the removal of a smaller area of trees of unknown quality option 16A will necessitate the removal of approximately 2ha less trees than 14 and will therefore have the least magnitude of impact of the two.

INDICATION OF ANY DIFFICULTIES ENCOUNTERED

This assessment is based solely upon its arboricultural merits (i.e. species and condition), does not account for any landscape or ecological values and has been reached without the benefit of any site survey work. The limitations of a desk-based appraisal are that only limited information can be gathered on groups of trees and in instances where street level imagery in unavailable then even a preliminary quality and value category cannot be assigned. Also, the quality and condition value which has been assigned to many of the tree groups must be subject to future review via a ground-based arboriculture survey for the preferred option at PCF Stage 3.

As more detailed design information becomes available a ground-based tree survey will be undertaken to gain more information on the trees which are likely to be affected by the works. This will enable the arboricultural impact of any future development to be more accurately defined and specific constraints to be identified and addressed as part of the on-going design.

SUMMARY

A summary of the impacts and overall significance of effect associated with each option is provided in the Table below.

Summary of impacts by option on arboricultural resource

OPTION	IMPACTS	SENSITIVITY	MAGNITUDE	SIGNIFICANCE
11	Removal of 0.15ha of moderate quality trees. Removal of 9.6ha of low quality trees. Removal of 0.75ha of trees of unknown quality. A total of 10.5ha of trees to be removed in total. An equal or greater area of new trees to be planted as mitigation.	Low/ Moderate	Medium (Adverse/ Beneficial)	Neutral
14	Removal of 6ha of low quality trees. Removal of 0.35ha of trees of unknown quality. A total of 6.35ha of trees to be removed in total. An equal or greater area of new trees to be planted as mitigation.	Low	Medium (Adverse/ Beneficial)	Neutral
16A	Removal of 4.1ha of low quality trees. Removal of 0.22ha of trees of unknown quality. A total of 4.32ha of trees to be removed in total. An equal or greater area of new trees to be planted as mitigation.	Low	Medium (Adverse/ Beneficial)	Neutral
16B	Removal of 1.3ha of low quality trees. Removal of 0.14ha of trees of unknown quality. A total of 1.44ha of trees to be removed in total. An equal or greater area of new trees to be planted as mitigation.	Low	Low (Adverse/ Beneficial)	Neutral

OPTION	IMPACTS	SENSITIVITY	MAGNITUDE	SIGNIFICANCE
18	Removal of 1.8ha of low quality trees. A total of 1.8ha of trees to be removed in total. An equal area of new trees to be planted as mitigation.	Low	Low (Adverse/ Beneficial)	Neutral

The magnitude of impact during and immediately post-construction is likely to be medium adverse, however, this will be mitigated over time by planting, which is anticipated to have a medium beneficial effect. The overall long-term arboricultural effect of all options is therefore considered to be neutral on the basis that only predominately low quality trees will be affected and that an equal area of potentially more resilient trees will be planted, as mitigation, and will be established once construction is complete.

APPENDIX 8.1
ECOLOGICAL DESK STUDY REPORT

APPENDIX 9.1
ENVIROCHECK REPORT

APPENDIX 11.1
GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human hearing is able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used, which reduces the importance of lower and higher frequencies in a similar manner to human hearing.

The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels found commonly in the environment is given in the table below.

Typical sound levels in the environment

SOUND PRESSURE LEVEL, dB(A)	LOCATION
0	Threshold of hearing
20 to 30	Quiet bedroom at night
30 to 40	Living room during the day
40 to 50	Typical office
50 to 60	Inside a car
60 to 70	Typical high street
70 to 90	Inside factory
100 to 110	Burglar alarm at 1m away
110 to 130	Jet aircraft on take off
140	Threshold of pain

The subjective response to a noise is dependent not only upon the sound pressure level and its frequency, but also its intermittency. Various indices have been developed to try and correlate annoyances with the noise level and its fluctuations.

- *Sound Pressure*: Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure
- *Sound Pressure Level (Sound Level)*: The sound level is the sound pressure relative to a standard reference pressure of 20 Pa (20×10^{-6} Pascals) on a decibel scale
- *Sound Power*: The sound energy radiated per unit time by a sound source. Measured in Watts (W)
- *Sound Power Level, L_W*: Sound power measured on a decibel scale, relative to a reference value of 10^{-12} W
- *Decibel (dB)*: A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by $20 \log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 Pa

- *A-weighting, dB(A)*: The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies
- *Noise Level Indices*: Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out
- $L_{eq,T}$: A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded
- $L_{max,T}$: A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response
- $L_{90,T}$: A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise
- $L_{10,T}$: A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise
- $L_{night,outside}$: The A-weighted long-term average sound level outdoor determined over all night periods of a year. The night period is taken to be the 8 hours between 23:00 and 07:00 hours. The sound level is the equivalent continuous sound level L_{eq}
- *Free-Field*: Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m away
- *Façade*: At a distance of 1m in front of a large sound reflecting object such as a building façade
- *Slow and Fast Time Weightings*: Averaging times used in sound level meters

VIBRATION

Vibration is defined as a repetitive oscillatory motion. Groundborne vibration can be transmitted to the human body through the supporting surfaces and in most situations, entry into the human body will be through the supporting ground or through the supporting floors of a building. Vibration from road traffic can also be airborne. Such airborne vibration is transmitted as a low-frequency sound wave and is often perceived when the sound wave causes windows or other objects to rattle.

Vibration is often complex, containing many frequencies, occurring in many directions and changing over time. There are many factors that influence human response to vibration. Physical factors include vibration magnitude, vibration frequency, vibration axis, duration, point of entry into the human body and posture of the human body. Other factors include the exposed persons experience, expectation, and activity.

Experience shows that disturbance or annoyance from vibration in residential situations is likely to arise when the magnitude of vibration is only slightly in excess of the threshold of perception.

The threshold of perception depends on the frequency of vibration. The human body is most sensitive to vibration in the frequency range 1 to 80 Hz and especially sensitive to vibration in the range 4 to 8 Hz. As with noise, a frequency weighting mechanism is used to quantify vibration in a way that best corresponds to the frequency response of the human body. In general, vibration is only perceptible in residential situations when the building is close to a railway, construction site or very close to a road that carries large and heavy vehicles.

- *Displacement, Acceleration and Velocity; Root Mean Square (r.m.s.) and Peak Values; and Peak Particle Velocity (PPV)*: Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). When describing vibration, one must specify whether peak values are used (i.e. the maximum displacement or maximum velocity) or r.m.s. / r.m.q. values (effectively an average value) are used. Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV), whilst human response to vibration is often described in terms of r.m.s. or r.m.q. acceleration
- *Root Mean Square (r.m.s.)*: The r.m.s. value of a set of numbers is the square root of the average of the squares of the numbers. For a sound or vibration waveform, the r.m.s. value over a given time period is the square root of the average value of the square of the waveform over that time period
- *Root Mean Quad (r.m.q.)*: The r.m.q. value of a set of numbers is the fourth root of the average of the fourth powers of the numbers. For a vibration waveform, the r.m.q. value over a given time period is the fourth root of the average value of the fourth power of the waveform over that time period
- *Attenuation*: A general term used to indicate the reduction of noise or vibration, or the amount (in decibels) by which it is reduced
- *Vibration Dose Value (VDV)*: This is a measure of the amount of vibration that is experienced over a specified period, and has been defined so as to quantify the human response to vibration in terms of comfort and annoyance. The Vibration Dose Value is used to assess the likely levels of adverse comment about vibration, and is defined mathematically as the fourth root of the time integral of the fourth power of the acceleration, after it has been frequency weighted to take into account the frequency response of the human body to a vibration stimulus. Measured in units of $m\ s^{-1.75}$

APPENDIX 11.2
CONSTRUCTION PHASE NOISE CONTROL

During the construction phase, it is recommended that the Contractor should apply BPM to minimise any residual noise impact. General methods of noise control include:

- The appropriate selection of plant, construction methods and programming. Only plant conforming with or better than relevant national or international standards, directives or recommendations on noise or vibration emissions will be used. Construction plant will be maintained in good condition with regards to minimising noise output and workers exposure to harmful noise and vibration
- Construction plant will be operated and maintained appropriately, having regard to the manufacturer's written recommendations. All vehicles and plant will be switched off when not in use
- The positioning of construction plant and activities to minimise noise at sensitive locations. Also, the design and use of site hoardings and screens to provide acoustic screening at the earliest opportunity
- Choice of routes and programming for the transport of construction materials, spoil and personnel to reduce the risk of increased noise and vibration impacts due to the construction of the scheme
- Vehicles and mechanical plant used for the purposes of the works should be fitted with effective exhaust silencers, be maintained in good working order and operated in such a manner as to minimise noise emissions. Only plant items that comply with the relevant EU/UK noise limits applicable to that equipment will be used
- Equipment that breaks concrete by munching or similar, rather than by percussion, will be used as far as is practicable
- The use of mufflers on pneumatic tools
- Where practicable, rotary drills actuated by hydraulic or electrical power should be used for excavating hard materials
- The use of non-reciprocating construction plant wherever practicable

APPENDIX 11.3
OPERATIONAL ROAD TRAFFIC NOISE CONTROL

A number of measures are available, which can be applied either in isolation or in combination, to mitigate the adverse effects of road traffic noise. Some scheme-related measures are set out below.

- *Horizontal alignment* – moving a route away from sensitive receptors
- *Vertical alignment* – keeping a route low within the natural topography can exploit natural screening
- *Environmental barriers* – in the form of earth mounding or acoustic fencing of various types, or a combination of the two
- *Low noise road surface* – most effective for noise generated by tyres of vehicles travelling at speeds in excess of 75 kph (c47 mph)
- *Speed and volume restrictions* – above about 40 kph, noise level increases with the speed of the vehicle; the volume and composition of traffic also have a direct effect on noise levels

The measures set out in the first two bullet points above should always be the primary objective when determining the vertical and horizontal alignment of the new and/or altered roads. However, it is acknowledged that it may not be possible to apply some of these techniques to this scheme. For example, there may be good engineering, environmental or structural reasons why the route cannot be aligned further away from the nearest dwellings, or placed so as to maximise screening.

Environmental barriers can provide reductions of 10 dB or more for well-screened locations relatively close to the source. But at further distances and particularly where the barrier provides only a small deflection of the transmitted sound, actual reductions may only be 1 or 2 dB. Beyond 200-300m the effects are often zero as the attenuation of absorbent ground cover becomes a significant factor[36]. Other considerations with respect to barriers are:

- The primary objective of any barrier should be to prevent a direct line of sight between the receptor and the noise source
- The higher the barrier, the greater the sound reduction, although, there will come a point where the additional benefit will not be cost-effective
- The closer a barrier is to the source, the greater will be the sound reduction
- Where a road is located on an embankment, the most efficient location for the barrier will usually be on the embankment as close to the edge of the carriageway as possible
- Where a road is located in cutting, there will be less need for a barrier
- A barrier will usually be less effective at screening upper floors of sensitive buildings
- Unless they are specifically designed and constructed to prevent this, a barrier can reflect sound, increasing noise levels at certain receptors located opposite barriers

The benefits likely to accrue from a low noise road surface will vary according to traffic speed and the type and age of surface. HD213/11 notes that compared with a standard hot rolled asphalt surface, the maximum allowable surface correction that can be claimed from using a thin surfacing system would be -3.5 dB. Such a difference is significant in that to achieve a comparable reduction in noise by reducing traffic flow, for example, would require at least a halving of traffic. However, HD213/11

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[36] The CRTN states (in paragraph 22.3) that "*the additional attenuation referred to as ground absorption….is ignored when calculating the effects of barriers since the near ground rays are obstructed. However, under certain circumstances (e.g. with low barriers erected on grassland) it is possible for these ground absorption effects to exceed the calculated screening provided by the barrier. The barrier will not raise the noise level in the screened zone, and in these circumstances the noise levels with and without the barrier should be calculated and the lower of the noise levels used*".

also advises that a low noise road surface is much less effective where traffic speeds are below 75 kph.

The reason for this is that a low noise surface will influence noise emissions from the interaction of tyres with the road surface. Where vehicle speeds are lower, noise from the engine, transmission and exhaust becomes more significant, therefore it would be cautious to claim less benefit from a thin surfacing system where vehicle speeds are less than 75 kph and the advice from HD213/11 (paragraph A4.27) is as follows: "*where the mean traffic speed is <75 km/hr, a -1 dB(A) surface correction should be applied to a low-noise surface…..Although it is likely that thin surfacing systems will provide more acoustic benefit at lower speeds, until further research is carried out to provide reliable estimates, it is advised that a qualitative statement highlighting the possible acoustic benefits is also included in the assessment*."

Vehicle speed and the proportion of heavy duty vehicles combine to form a correction that is applied to the noise level determined from the vehicle flow. Above about 40 kph, the higher the speed, and the higher the proportion of heavy duty vehicles, the greater will be the correction. This correction can be significant. For example, with 6% heavy duty vehicles, reducing vehicle speed from 80 kph to 64 kph (50 mph to 40 mph) would result in a 1.5 dB reduction in road traffic noise, all else remaining equal. This is equivalent to a reduction in overall flow approaching 30%.

With respect to speeds associated with vehicles using the five options, it is interesting to note that the free-flowing link between the A34 and M3 under options 14 and 16A, will have a design speed of 85 kph compared to a design speed of 120 kph for the same link under option 11. With 6% heavy duty vehicles a speed of 85 kph compared to 120 kph would result in a 2.9 dB reduction in road traffic noise for that particular link.