

M3 Junction 2 to 4a Smart Motorway

Environmental Assessment Report Volume 1 – Main Report

Report Number: 47065129-URS-05-RP-EN-002-4F
February 2014

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SCHEDULE OF REVISIONS

Revisions Issued Since First Issue – *for internal and Client use only. To be removed before publication by Highways Agency website*

Report Revision Number	Revision Date	Paragraphs amended
0D	22/04/2013	First Draft.
1A	07/06/2013	First issue of compiled report to Highways Agency.
2A	December 2013	Second issue, addressing the Highways Agency's comments.
		Scheme title changed from "Managed Motorway" to "Smart Motorway" throughout.
		Para 1.1.1 – scheme dates amended.
		Refs to IAN 161/13 updated throughout (superseded IAN 161/12).
		Para 1.2.3 – 1.2.5 text amended to more clearly explain requirement under Section 22 of the Planning Act 2008; ref to IPC removed.
		Para 1.3.2. text amended as per Highways Agency comment.
		Para 2.1.4- scheme dates amended.
		Section 2.3 to 2.5 – renumbering of sections to separate existing M3 description (now Section 2.3) from proposed Scheme description (now 2.4); traffic modelling now Section 2.5. Further detail on existing M3 added. Section 2.3 extended to include some description of other existing environmental assets/constraints.
		Para 2.3.11 (now para 2.3.9) – no. of Important Areas updated; para 2.3.12 (now para 2.3.10) – text on Noise Action Plans amended.
		Table 2.1: Proposed new noise barriers – details updated.
		Text updated to reflect 100% CCTV coverage (in accordance with IAN 161/13).
		Section 2.5 – Traffic modelling. Text updated to reflect traffic model scenarios used in revised assessments, in response to air quality mitigation requirements.
		Section 5: Various amendments throughout chapter to include mitigation proposals.
		Para 7.6.10, 7.6.12: impacts amended to minor adverse (giving slight adverse effects) in response to previous comments from the Highways Agency.
		Section 7: assessment of impacts and effects updated to reflect revised gantry locations.
		Chapter 8 Updated to reflect latest air quality and noise assessment results (Dec 2013).

Report Revision Number	Revision Date	Paragraphs amended
		Section 8.2_Policy: less relevant policies removed.
		Section 8.4 – Assessment Methodology; text reduced – cross referenced to Ch 4 for generic methodology.
		Refs to Appendices 8.3.1 and 8.3.2 – Badger report – altered; badger reports now excluded from Appendices (subsequent appendices relating to Ch 8 have been renumbered).
		Section 8.8 – details regarding works through Thursley, Ash, Pirbright and Chobham Common SAC and Thames Basin Heaths SPA, updated.
		Section 8.12 Summary: now reflects overall slight adverse effects.
		Para 9.4.7 and Para 9.7.2. Text added on presence of historic landfills in proximity to motorway.
		Chapter 11: deleted as Road Drainage and Water Quality remains scoped out.
		Chapter 12: now Chapter 11.
		Para 11.5.10 and 11.5.11: wording amended to provide greater clarity re. land-take outside and within the Strategic Road Network boundary.
		Table 11.1. Transportation schemes which have already been completed have been removed from the table (these are included in the traffic model for the do-minimum scenarios). Table 11.1 updated to reflect all transport scheme included in the revised traffic model Oct 2013.
		Table 12.1 (previously Table 13.1) updated to reflect updated assessments.
3F	07/02/14	Third issue addressing the Highways Agency's and statutory consultees' comments.
		All HA abbreviations changed to 'Highways Agency'.
		Para 2.4.3 Operational Layout Drawings have been replaced by Environmental Masterplans.
		Para 2.4.5: Text modified to reflect design change.
		Para 2.4.8 Deleted reference to Appendix 2.1.
		Para 2.4.19 Lane 4 will also be resurfaced.
		Para 2.5.2 amended to specify proposed mitigation measure.
		Section 4.9 added, summarising comments received and response provided.
		Para 5.4.10 Added reference to Table 2.3 in guidance as per Highways Agency's comment.

Report Revision Number	Revision Date	Paragraphs amended
		Para 5.7.39: Text modified, overall no significant impact reported.
		Para 5.7.45 and 5.7.46: Change to total property numbers.
		Table 5.12 and 5.13: Changes made to all table values.
		Table 5.16 and 5.17 inserted. Previous Table 5.16 is now 5.18.
		5.10.4: Text added to summarise effect of change in NO _x and N-deposition on designated ecosystems.
		Para 7.5.1, 7.6.4 and 7.6.11: Change to the number of gantries and references the installation of CCTV (7.6.4 and 7.6.11).
		Para 7.6.3: Reference to Figure 7.2 added.
		Para 7.6.5, 7.6.10, 7.6.12, and 7.6.14: added reference to works in para 7.6.2.
		Para 7.6.7, 7.6.9 and 7.6.13: Ref to installation of CCTV added.
		Para 7.6.14: Incomplete sentence deleted.
		Para 7.8: Paragraph 7.8.2 removed.
		Table 8.2 Ref to marsh fritillary removed as per NE comment
		Table 8.9 Text modified in relation to control of invasive and non-native species.
		Para 8.8.39: Error message removed.
		Para 8.8.30: Monitoring of nesting locations added as a mitigation measure as per NE comment.
		Para 8.8.34 as agreed with NE restricting timing of construction works in Chobham Common.
		Para 8.8.99: Change to total loss of vegetation from 4.3ha to 4.43 ha.
		Table 8.10 Changes to total habitat loss.
		Para 8.9.3: Paragraph added on monitoring of nesting locations for sensitive birds.
		Table 8.11: Rare reptiles text modified as per HA comment.
		Para 9.2.1, 9.2.2, 9.5.2 and 9.9.1 and Table 9.3 amended to reflect change in legislation with regards to SWMP.
		Para 10.1.3: Text revised. This also ties in with newly inserted paragraph 10.5.8.
		Para 10.3.2: Text revised as per HA comment.
		Para 10.5.8 added to describe the purpose of the monitoring.
		Para 10.6.4 Text modified.
		Para 10.7.3 and 10.10.3: Text revised to include reference to temporary noise barriers.

Report Revision Number	Revision Date	Paragraphs amended
		Para 10.7.4 and 10.10.4: Text revised.
		Para 11.4.1 amended as per HA comment.
		Table 12.1 amended to provide some additional detail and reflect added mitigation measures.
		Para 13.1.3 amended as per HA comment.
		Para 13.3.1 and 13.4.1 amended
4F	20/02/2014	Para 1.1.1 amend date of fully operational
		Para 2.5.2 amended to clarify length of speed limit
		Section 4.9 reduced and letters to consultees included in an Appendix 4.1
		Table 5.18 text amended to clarify length of speed limit
		Par 5.7.40 Draft removed from IAN reference
	26/02/2014	Table 2.1: footnote inserted explaining additional noise modelling.
		Para 4.9.3 and 10.6.3: text inserted explaining additional noise modelling.

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*figure presented in main text of EAR

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1. INTRODUCTION

1.1 Overview of the Scheme

- 1.1.1 The Highways Agency is developing a Smart Motorway (SM-ALR) scheme to provide improvements to the M3 between Junctions 2 and 4a to the west of London. The Scheme is being delivered under the Highways Agency's Project Support Framework and includes developing an engineering design and undertaking environmental assessment along approximately 14.9 miles (24km) of the motorway. Construction work is proposed to commence in Spring 2014 and is intended to be finished by the end of 2015. The scheme would be fully operational from August 2016. Figure 1.1 shows the geographic location of the scheme and the surrounding motorway network.

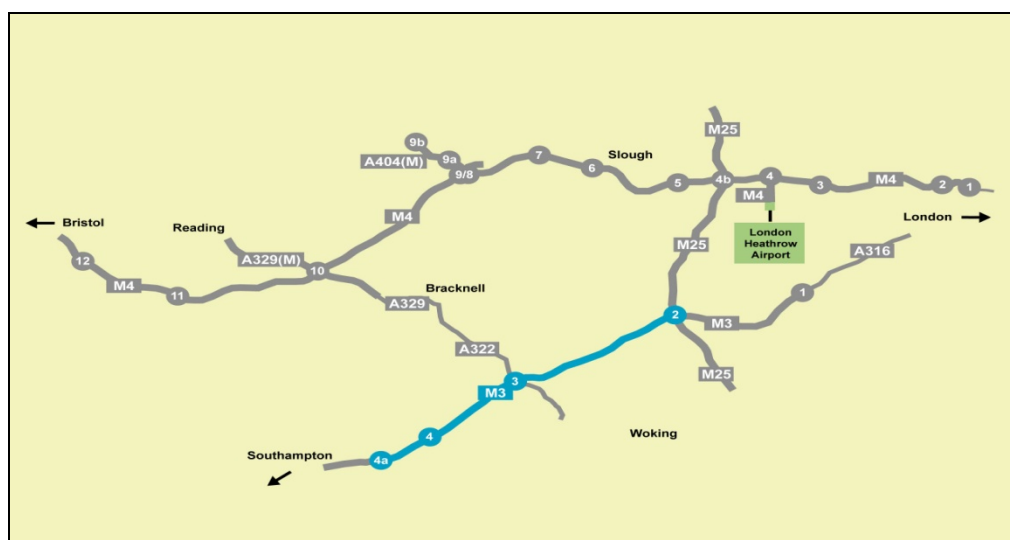


Figure 1.1- Scheme Location

- 1.1.2 Smart Motorways make use of a range of traffic management measures to control speeds and inform road users of conditions on the network. To reduce congestion, the hard shoulder is used as an additional traffic lane, with the use of indicators and variable signs to control traffic speed and the use of Emergency Refuge Areas (ERAs).
- 1.1.3 The overall objective of the M3 Junction J2 to 4a SM-ALR scheme, herein referred to as “the Scheme”, is to provide an operational solution along the length of the Scheme to improve safety of road users and alleviate congestion, thus improving journey time reliability. The aim is to tackle congestion through the conversion of the hard shoulder to a permanent running lane, along with the ability to dynamically control vehicle speeds through the introduction of new technology. All proposed work is to be undertaken within the existing highway boundary.

1.2 Purpose of the Environmental Assessment Report

- 1.2.1 The European Community (EC) Directive 2011/92/EU requires that an Environmental Impact Assessment (EIA) should be undertaken by the promoters of certain types of development to identify and assess the environmental consequences of projects before development consent is given. The

requirements for qualification for a statutory EIA, and the process by which an EIA should be undertaken are detailed within Directive 2011/92/EU, and revises Directives 85/337/EEC, and its amendments 97/11/EC, 2003/35/EC and 2009/31/EC.

- 1.2.2 The proposed scheme has been classified as a relevant Annex II Project, under the Directives. Developments listed under Annex II may need to be subject to EIA depending on whether the proposal qualifies as a 'relevant project' and could give rise to significant effects. Criteria and thresholds on what constitutes a relevant project are contained in Annex II of the Directive. Consideration must also be given to the potential to generate significant environmental effects as described within Annex III of the EIA Directive. The Scheme, as an Annex II relevant project, requires an appropriate level of environmental review.
- 1.2.3 The Planning Act 2008, as amended by the Localism Act 2011, sets the framework for Nationally Significant Infrastructure Projects (NSIPs). The M3 J2-4a SM-ALR Scheme constitutes an improvement scheme and requires no permanent land-take outside the Strategic Road Network (SRN) boundary. As an improvement scheme, the Scheme would meet the definition of a NSIP, under Section 22 of the Planning Act 2008, if it would be likely to have a significant effect on the environment. If significant environmental effects are predicted, a statutory Environmental Impact Assessment (EIA), leading to the production of an Environmental Statement (ES) would be required and the Scheme would require a Development Consent Order in order to proceed.
- 1.2.4 The purpose of the Environmental Assessment reported here is to assess whether or not significant environmental effects would be likely to occur as a result of construction and/or operation of the Scheme and hence whether or not a statutory EIA is required.
- 1.2.5 The process for screening the requirement of statutory EIA for a proposed scheme is recorded in a Record of Determination (RoD). This Environmental Assessment Report (EAR) supports the RoD for the Scheme, which will summarise the conclusions of this EAR and state whether the proposed scheme requires statutory EIA or not based on the significance of the predicted environmental effects. The RoD is subject to approval by the Highways Agency Project Manager and NetServ specialists on behalf of the Secretary of State (SoS).
- 1.2.6 A Notice of Determination (NoD) will be published detailing the Secretary of State for Transport decision as to whether a statutory EIA will or will not be required; the decision will then be subject to a challenge period of six weeks. The NoD will be published in the London Gazette, in a local newspaper circulating in the area within which the Scheme is situated, and on the Highways Agency Project website.

1.3 Status of the Environmental Assessment and the Report

- 1.3.1 The Highways Agency, as the Overseeing Organisation, has commissioned URS, the Designer, and Balfour Beatty, the Delivery Partner (herein referred to as the Contractor) to take forward the Scheme through Stage Gate Assessment Review (SGAR) 3 and 5 of the Project Control Framework process, which includes detailed design and construction.

1.3.2 The Scheme has been subject to an environmental review and reporting process to establish whether the proposals are likely to result in significant environmental effects. Environmental Assessment work undertaken at SGAR 1 and 2 included producing a Scoping Report in March 2012, followed by an Interim EAR produced in April 2012. This environmental work was used to inform the up-dated Scoping Report, produced in January 2013 as part of the SGAR 3 and 5 of the Project Control Framework process (Highways Agency, January 2013).

1.3.3 Previous assessment work predicted that the Scheme is not likely to result in significant environmental effects. However, it was identified that further simple and detailed level assessments were required for several topics before any requirement for a statutory EIA could be confirmed or otherwise. Building on the previous work undertaken in 2012, the results of these assessments are presented in this report.

1.4 Scope and Content

1.4.1 This environmental assessment has been used to inform the design process and aid in the development of appropriate mitigation measures. The assessment took place concurrently with the development of the Scheme design, and this iterative process sought to reduce the severity of the impacts and increase the potential for successful mitigation measures to be fully incorporated into the Scheme.

1.4.2 This report documents the environmental assessment process and how the potential environmental impacts have been addressed. Details of surveys and assessments undertaken to compile a comprehensive baseline are given for each topic, this was then used to identify potential changes arising as a result of the proposed Scheme, the level of impact is shown and mitigation included where appropriate. It has been produced as a deliverable in fulfilment of the Highways Agency's SGAR 3 and 5 product requirements.

1.4.3 This document presents the findings of the surveys, assessments and mitigation required to support the RoD and subsequent publication of the NoD.

1.4.4 This EAR has been produced following the guidance given in DMRB Volume 11, Section 2, Part 6, Reporting of EIAs and supplemented by Interim Advice Note (IAN) 133/10 Environmental Assessment and the Planning Act 2008 & IAN 125/09 Supplementary guidance for users of DMRB 11 "Environment Assessment".

1.5 References

Highways Agency, January 2013, M3 Junction 2 to 4a Managed Motorway Environmental Scoping Report.

Highways Agency, April 2012, M3 MM J2 to 4a Scheme, PCF 114 Interim Environmental Assessment (SGAR2).

Highways Agency, March 2012, M3 Junction 2 to 4a Managed Motorway Environmental Scoping Report (SGAR 2).

Highways Agency, November 2010, Interim Advice Note 133/10, Environmental Assessment and the Planning Act 2008.

Highways Agency, October 2009, Interim Advice Note 125/09, Supplementary Guidance for Users of DMRB 11 "Environment Assessment".

Highways Agency, August 2008, Design Manual for Roads and Bridges, Volume 11, Section 2, Part 6, Reporting of Environmental Impact Assessments.

2. THE SCHEME

2.1 Development of Smart Motorways

- 2.1.1 The M3 J2 to 4a Scheme was included in the 'Advanced Motorway Signalling and Traffic Management Feasibility Study' (Department of Transport, March 2008). This initial review concluded that hard shoulder running (HSR) with Active Traffic Management could provide a large proportion of the benefits of widening at a significantly lower cost than conventional motorway widening.
- 2.1.2 In the Chancellor's autumn 2011 statement, it was announced that a new MM specification – MM All Lane Running (MM-ALR) was to be developed and implemented which would reduce scheme capital and whole life costs whilst delivering congestion benefits. This is achieved by a permanent conversion of the hard shoulder to a running lane and removes the complex operating procedures related to opening and closing the hard shoulder. The M3 J2 to 4a MM was identified as one of these managed motorways due to start works, subject to the completion of statutory processes.
- 2.1.3 Managed Motorways are now referred to a Smart Motorways and the Scheme is now titled M3 J2 to 4a Smart Motorway (SM-ALR).
- 2.1.4 On 19 November 2012, the accelerated delivery pilot was announced by government with the ambition to cut the time required to upgrade our roads by half. This directly affects the managed motorway schemes (now known as smart motorways) and an accelerated programme has been put forward for the M3 J2 to 4a scheme.
- 2.1.5 Under the accelerated programme for the M3 J2 to 4a scheme, the current intention is for works to commence on site in Spring 2014, subject to a statutory Environmental Statement not being required and associated examination of the scheme conditions by the planning inspectorate. Construction of the scheme is intended to be completed by the end of late 2015 with the Scheme fully operational in Spring 2016.
- 2.1.6 The Highways Agency has refined the design of SM-ALRs based on operational experience and value management expertise. In accordance with the standard approach for all Highways Agency projects, this scheme follows guidance set out in the Design Manual for Roads and Bridges (DMRB). The Agency's advice notes and IANs have been referred to, in particular; IAN 161/13 Managed Motorways: All Lanes Running (MM-ALR).

2.2 Project Objectives

- 2.2.1 The overall M3 SM-ALR Scheme objectives include the following components:
- To alleviate any existing transport and safety problems identified on the motorway links. Once open to traffic, the project should not detrimentally affect traffic on the surrounding road network.
 - To enhance the role of these major motorway arteries by improving the quality of information provided to drivers about the state of the motorway.
 - To relieve congestion, improving journey time reliability, reducing the number of fatalities, casualties and incidents.
 - To maximise the effectiveness of mitigation of environmental impacts.

- To result in no worsening of the overall existing environment and to consider enhancement where feasible.
- To provide journey time reliability benefits to traffic on these links in comparison to the “do nothing” baseline set for economic appraisal of the project.
- To minimise the impact of the severance of local thoroughfares for non-motorised users.
- To support local and regional development plans and government policy.
- To ensure that the project takes into account the capacity improvements planned on adjoining routes.

2.2.2 The proposed Scheme design is summarised in Section 2.4 below. Alternatives which were considered during development of the Scheme are described in Section 3.

2.2.3 Smart Motorways control traffic for congestion and incident management. The hard shoulder is used as a permanent traffic lane and with the use of supporting technology and signs, traffic is controlled by informing drivers of mandatory speed limits and lane availability. The use of ERAs provides safe areas for drivers to stop in an emergency.

2.3 The Existing M3 J2 to 4a

2.3.1 The Scheme is located on the M3 between Junction 2 and 4a in both directions and is approximately 14.9 miles (24km) long. The M3 joins the M25 at Junction 2 and goes through the counties of Surrey and Hampshire. Between Junctions 2 and 3 the motorway cuts through a predominantly rural corridor, within which there are a number of European protected sites; of particular interest is Chobham Common, which has been designated as a National Nature Reserve (NNR), Site of Special Scientific Interest (SSSI), a Special Protection Area (SPA) and a Special Area of Conservation (SAC): part of the site falls within the Strategic Road Network (SRN) boundary. Between Junction 3 and 4a the motorway cuts through an urban corridor.

Environmental Constraints

2.3.2 The key environmental constraints of the Scheme are summarised below:

Air Quality

2.3.3 There are two Air Quality Management Areas (AQMAs) identified within 200m of the Scheme extent:

- Surrey Heath Borough Council AQMA.
- Runnymede Borough Council AQMA.

Nature Conservation

2.3.4 The M3 runs through Chobham Common between J2 and J3. Chobham Common has been designated as a Local Character Area ‘South Chobham Common Heathland’, a Natura 2000 site, a National Nature Reserve (NNR) and a Site of Special Scientific Interest (SSSI). The conglomerate of a number of different statutory designations means that the site is well protected under statutes.

- 2.3.5 Sites receive legal protection from either the Wildlife and Countryside Act 1981 (as amended) (SSSIs) or the Conservation of Habitats and Species Regulations 2010 (as amended) (Natura 2000 sites) with both restricting damaging actions, including development, which may impact a site's ecological integrity.
- 2.3.6 There are four Natura 2000 sites within the study area. Natura 2000 sites include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) designated under the Conservation of Habitats and Species Regulations 2010. These sites are of international conservation value. The four sites are:
- Thames Basin Heath SPA (including Chobham Common and Bagshot Heath).
 - Thursley, Ash, Pirbright and Chobham SAC (including Chobham Common.
 - National Nature Reserve (NNR) and Site of Special Scientific Interest (SSSI) and Bagshot Heath (SSSI).
 - Southwest London Water Bodies SPA/Ramsar (100m from the Scheme).
 - Mole Gap to Reigate Escarpment SAC (~18km, Bechstein's (*Myotis bechsteinii*) bats are a qualifying feature).
- 2.3.7 For part of the Scheme the highway verge lies within Thursley, Ash, Pirbright and Chobham SAC and the Thames Basin Heath SPA, and therefore there is potential for significant adverse effects. Chobham Common is also designated as a SSSI and NNR.
- 2.3.8 In parallel with environmental assessment, determination of the requirement for appropriate assessment under The Conservation of Habitats and Species Regulations 2010 has been undertaken separately and is reported in the Assessment of Impacts on European Sites (AIES) report. The report addresses each of the four Natura sites listed above. Thames Basin Heaths Special Protection Area (SPA) and Thursley, Ash, Pirbright and Chobham Special Area of Conservation (SAC) and SPA are located within and directly adjacent to the scheme. Similarly the South West London Water Bodies SPA and Ramsar site is located approximately 100m from the Scheme at its closest point and is directly linked by the River Bourne which passes beneath the M3 carriageway.

Noise

- 2.3.9 Seventeen Important Areas have been identified in Defra's Noise Action Plans on this section of the M3, 9 of which have been designated as First Priority Locations. These have been identified primarily between Junctions 3 and 4a, with a number of isolated locations between Junctions 2 and 3.
- 2.3.10 The Noise Action Plan is a tool that was developed to comply with the requirements of the Environmental Noise Regulations to assist in the management of environmental noise and its effects, including noise reduction if necessary, in the context of government policy on sustainable development.

Other Environmental Constraints

- 2.3.11 In addition to the key constraints identified above, other environmental constraints which require consideration include landscape, visual receptors and cultural heritage. There are no designated Landscape areas in the vicinity of the existing M3 J2-4a; however there are a number of residential areas located to either side of the motorway, including some Conservation Areas, which have views of the existing motorway. There are no areas of archaeological potential or

features of valuable built heritage within the SRN boundary, though there are a number of Conservation Areas and built heritage assets within 1km of the existing motorway.

- 2.3.12 With regards to water resources, the existing motorway crosses a number of surface watercourses including the River Bourne, Blackwater River, Cove Brook and Windle Brook. It is underlain by strata primarily comprising Secondary Aquifers, with a Principal Aquifer in the vicinity of J2 (between chainages 1200 to 2900).
- 2.3.13 There are, in addition, a number of Public Rights of Way which are crossed by the existing motorway.
- 2.3.14 As will be discussed in Section 2.4, water resources are unlikely to be significantly affected by the M3 J2-4a Scheme proposals and have therefore been scoped out of further assessment, with the proviso that appropriate measures are put in place during construction to ensure that this remains the case.

Existing Infrastructure

- 2.3.15 Existing structures along the M3 J2-4a include existing gantries and signs, 14 overbridges, six underbridges and 20 existing noise fences (nine on the westbound side of the motorway and 11 on the eastbound side). The existing central reserve safety barrier comprises of a continuous length of steel crash cushion. Where the central reservation widens between Junctions 3 and 4a, the crash cushion splits into two and is located either side of the vegetated central reservation.
- 2.3.16 There is no existing lighting along the mainline of the M3, except around the junctions at J2, J3, J4 and J4a and on the slip roads.
- 2.3.17 Existing drainage along the M3 J2-4a comprises of surface water channels, kerbs and gullies, combined sub-surface and surface filter drains and over the edge drainage with outfalls to watercourses and water bodies outside the SRN boundary.
- 2.3.18 The motorway verges tend to be relatively narrow, being around 2.5m on average, down to as little as 0.3m, though wider in a few places (up to 22m).

2.4 Description of the Proposed Scheme

- 2.4.1 For the purpose of describing the Scheme and to ensure consistency with other Scheme documents, the westbound and eastbound carriageways are herein referred to as carriageway A and carriageway B respectively.
- 2.4.2 The Scheme design takes into account the requirements and guidance contained within IAN 161/13 – Managed Motorways – All Lane Running (Highways Agency, 2013). The key elements of the SM-ALR design concept are as follows:
- Permanent conversion of the hard shoulder on the main line to a controlled running lane.
 - The Scheme will be delivered within the existing highway boundary.

- Existing portal gantries will be used where appropriate. Where possible verge mounted local information signage will be retained, or where necessary, strategic cantilever message signs will be utilised.
- There is no through junction running on the M3 scheme. However, the design is to make provisions to be able to change to through junction running in the future, if required.

Key Infrastructure

2.4.3 Key infrastructure positions assessed in this EAR are presented in the M3 SM-ALR Environmental Masterplans (Appendix 2.1). The locations of the infrastructure have been fixed with due regard to environmental constraints. Where possible, and as part of the design process, infrastructure has been located to minimise an environmental impact on a recorded environmental feature.

2.4.4 Variable mandatory speed limits (VMSL) will be provided using verge mounted carriageway signalling displayed on Variable Message Signs (VMS) and lane specific signalling where required.

Gantries

2.4.5 Two existing MS3 Cantilever gantries and three existing single span portals have been identified to be in suitable locations and with sufficient residual life to remain as they are. One existing single span portal is to remain where it is but is to be modified and two existing single span portals are to be removed.

2.4.6 The Scheme would introduce 55 new gantries of five types:

- 28 Motorway Signal Mark 4 (MS4) Cantilevers. The MS4 is a dual colour matrix sign, capable of displaying both text and pictograms. These are sometimes referred to as MS4 cantilever 'hockey stick' gantries.
- 10 ADS Cantilever gantries- located at junction approaches. These will be designed and constructed in accordance with principles established within IAN 161/13.
- 17 Superspan portals and long span Cantilevers. These will be installed as both signal and sign gantries, with instances where signals and signs co-exist on the same gantry structures. Sign and signal gantries will have the same basic design structure, protection, service and mounting requirements as a signal gantry.

Emergency Refuge Areas (ERAs)

2.4.7 Emergency Refuge Areas (ERAs): 12 ERAs are required to permit vehicles to stop in an emergency without interrupting the flow of traffic in lane 1. These are constructed within the existing highway verges.

Signage

2.4.8 Associated road signs will be required within the verge. Additional permanent electronic signs will be installed to facilitate traffic management in the verge.

Supporting Works - Technology

- 2.4.9 Vehicle detection systems will be provided to support incident detection, queue protection, VMSL and congestion management.
- 2.4.10 In accordance with IAN 161/13, CCTV will provide comprehensive, 100% general surveillance coverage of the scheme; the associated masts will be located adjacent to gantry foundations wherever possible and will be positioned to complement the existing coverage of surveillance cameras in order to provide a view of conditions on the motorway and to help to detect and manage any incidents.
- 2.4.11 Emergency roadside telephones (ERTs) will be provided in ERAs and at mid-points between Junctions.
- 2.4.12 Motorway Incident Detection and Automatic Signalling (MIDAS) Loop Induction Systems: MIDAS loops can be utilised for automatic signal setting, queue protection, congestion settings, incident detection, vehicle counting and ramp metering facilities. These facilities serve to ensure a better flow of traffic.
- 2.4.13 Highways Agency Digital Enforcement Cameras (HADECS): HADECS will be used to enforce variable speed limits under the Active Traffic Management (ATM) system.
- 2.4.14 Electrical Interface (EI) Cabinets: EI cabinets will be utilised to provide a point at which electricity supply will be available.
- 2.4.15 Cross Carriageway Ducts (CCDs): CCDs will be employed at a number of locations, where connection between local cabling running parallel with the main carriageway is required. This is achieved via ducting, constructed by drilling beneath the main carriageway and requiring construction pits in the motorway verge to thrust from and receive the drilling plant.
- 2.4.16 Communications Cabinets will be utilised to provide a location of housing the communications controllers.

Vehicle Restraint System (VRS) (Crash Barriers)

- 2.4.17 The existing Vehicle Restraint System (VRS) in the central reservation will be replaced by a concrete barrier along its length. The works will result in a narrower central reservation for much of the Scheme length.
- 2.4.18 Due to the nature of the verge works, the majority of the verge VRS will be replaced and additional lengths provided where required for new infrastructure. VRS that is no longer required will be removed.

Pavement Strengthening and Resurfacing

- 2.4.19 The hard shoulder will become a permanent running lane and therefore will be strengthened where required. The hard shoulder and lane 4 will be resurfaced with a low noise surfacing.

Earthworks

- 2.4.20 As the existing verge is narrow, ERAs and gantries and their associated infrastructure will be constructed in cuttings and on embankments. A range of retaining structures will be utilised to provide the appropriate space; these include

steepened granular slopes, steel sheet piled walls and concrete bored pile walls. Small retaining structures will be built around chambers containing buried ducts for cables.

Lighting

- 2.4.21 No major new lighting is proposed as part of the Scheme. One new lighting column will be located at Junction 2, within the central reservation. This area is already lit and the new lighting column will extend the lit area by no more than 40m towards Junction 3. The signs on the gantries will be illuminated with directional lighting. As the gantries straggle the carriageway, this lighting is located over the carriageway. Light will be emitted from the light emitting diode (LED) message signs, with the sign face above the inside lane, thus light spill is considered negligible. Some existing lighting will be replaced with current standard lamps and columns. High pressure sodium lamps will be used and current lighting standards aim to minimise light spill.

Noise Barriers

- 2.4.22 Any mitigation of significant noise impacts created by the Scheme will be provided through use of noise barriers, subject to detailed design and where noticeable noise reductions cannot be delivered through other means, such as low noise surfacing materials. Existing noise barriers are to be retained with alterations and 16 additional new noise barriers are to be provided only where justified following assessment. A schedule of proposed new noise barriers is provided in Table 2.1 below.

Table 2.1: Proposed New Noise Barriers

Carriageway	Chainage		Height (m)	Barrier type
	Start	Finish		
Westbound	2400	2600	2.5	Reflective
Westbound	2600	2800	2.5	Reflective
Westbound	2810	2850	2	Reflective
Westbound	9000	9400	2.5	Reflective
Westbound	12500	12750	2.5	Reflective
Westbound	22500	22650	4	Reflective
Eastbound	2350	2700	2.5	Reflective
Eastbound	2700	2800	2.5	Reflective
Eastbound	2810	2940 ¹	2	Reflective
Eastbound	8320	8525	2.5	Reflective
Eastbound	10800	10980	2.5	Reflective
Eastbound	10980	11150	2.5	Reflective
Eastbound	12500	12750	2.5	Reflective
Eastbound	12850	13125	3	Reflective

¹ Additional noise modelling is being carried out to Chainage 2940-3100 in response to recent comments to establish whether noise levels in this area warrant an extension of the proposed noise barrier by an additional 100m.

Carriageway	Chainage		Height (m)	Barrier type
	Start	Finish		
Eastbound	18800	19175	4	Absorptive
Eastbound	22325	22425	3.5	Absorptive

Drainage, Pollution Control and Spillage Containment

- 2.4.23 Scheme construction will create new paved areas, including paved areas associated with the ERAs and with the construction of the concrete barrier in the central reservation.
- 2.4.24 With regards to the central reservation, this will be narrowed and paved, with lane widths reduced as permitted in IAN 161/13, both of which would combine to allow for an increase in the width of the verge. Overall, it is considered that the paving of the central reserve would not result in an increase in the impermeable area (refer to the M3 J2 to 4a SM-ALR, Specification Series 500 (Highways Agency, 2103b)). The only increase in impermeable area would therefore be associated with the ERAs.
- 2.4.25 Under the proposed Scheme, existing drainage will remain largely unchanged, except for a new surface water collection feature at the motorway edge. This will connect into the existing drainage network, and the existing outfalls from the motorway will continue to be used and will be unchanged.
- 2.4.26 New drainage will be associated with the ERAs, and slot drains or channels will be provided in the central reservation and verges. Any additional flows associated with the ERAs will be attenuated such that existing discharge rates are maintained.
- 2.4.27 Remedial drainage works inherited from the existing M3 maintenance requirements are planned for a section of drainage on the B carriageway between Junctions 3 and 4. The remedial works are not part of the M3 J2 to 4a SM-ALR Scheme, i.e. the improvement scheme, and will be subject to a separate environmental assessment report. These works are therefore not detailed within this EAR.
- 2.4.28 During construction, the EA Pollution Prevention Guidelines will be implemented and work will be confined within the boundaries of the highway. (See Construction and Temporary Works below.) Spillage containment measures will be built into the ERA design. The existing network as designed can accommodate an increase in capacity of run off rates due to climate change. The implementation of these measures, including attenuation of any additional run-off at ERAs, should ensure that there are no adverse impacts on the water environment as a result of the Scheme.

Construction and Temporary Works

- 2.4.29 Construction works will have full regard to the environment and works have been developed in consultation between the design team and the Contractor. Full control measures to reduce impacts will be described in the Contractor's Construction Environmental Management Plan (CEMP) and will follow legislation and best practice guidelines, for example the Environment Agency Pollution Prevention Guidelines. All ground disturbed for temporary construction works will

be re-instated and made good. The following assumptions have been made regarding the construction of the Scheme:

- Access will be from the hard shoulder only, except at Kitsmead Bridge (ch 4650), where access will be from adjacent land. At Kitsmead Bridge there are proposals to have a vehicle recovery area and a storage area;
- Storage compounds will, where possible, be located adjacent to the M3;
- Construction works will also take place outside of normal working hours, where necessary and appropriate and subject to any special measures to control noise and lighting nuisance;
- Temporary CCTV will be installed;
- Temporary signs will be placed within the verge;
- Where necessary the verge immediately adjacent to the carriageway will be temporarily hardened to allow movement of construction vehicles and equipment during the verge works; and
- Planing out of the hard shoulder and re-instatement will be undertaken where pavement strengthening of the hard shoulder is required.

2.4.30 Most construction compounds were not confirmed at the time of writing and as such have not been assessed in this environmental assessment. It is understood that construction compounds can benefit from permitted development rights (thereby not needing planning permission), subject to them being located 'adjacent' to the Scheme and the other limitations as defined within the Town and Country Planning (General Permitted Development) Order 1995. One site has been identified to be used immediately adjacent to the Scheme and Highways Agency owned, just east of Kitsmead Lane. This site has been assessed and, where required, mitigation proposed.

2.4.31 For those compounds that are not adjacent to the scheme, planning permission may be necessary and if this is the case then separate planning application submissions would be needed. Accordingly, sites identified for use adjacent to the Scheme will be assessed and mitigated for notwithstanding the fact that they do not need planning permission. Sites that are located in more distant locations and therefore not 'adjacent' to the Scheme are to be assessed as part of any separate planning application submissions that may be necessary.

2.4.32 There may be requirements to temporarily close some Public Rights of Way to allow works to be undertaken on a number of underbridges. These are at Rushy Pond Subway, Broadway Road underbridge and Trumps Mill underbridge. Where closure or diversions to PROWs are required, the Contractor will be responsible for ensuring that the required notices are posted in advance and that any disruption to non-motorised users is minimised.

2.5 Traffic Modelling

2.5.1 The noise and air quality assessments reported in this EAR are based on Core traffic data generated by the traffic model for the Scheme. The details of the current Scheme and the forecasting methodology are described separately within the Traffic Forecasting Report (Report Ref: 1044049-D04-005) Current one-way 18 hour flows on the M3 between Junctions 2 and 4a range from 54,000, with 8% HGV to 63,000 with 9% HGV. The Scheme would result in increased traffic flows in opening year of generally between 3 and 6%, with some larger localised increases in the vicinity of the M25 (J2).

2.5.2 The traffic model incorporates mitigation measures which were identified as being required after initial air quality impact assessment of the Scheme indicated that there would be potentially significant adverse impacts on local air quality at a number of locations (refer to Chapter 5 – Air Quality). A number of air quality mitigation options were assessed for their ability to mitigate the adverse effects. The results of this exercise are presented in a Technical Note (Highways Agency, 2013c). The mitigation measure identified was to restrict speed to 60mph through Junction 4 for 4km on the eastbound carriageway and 4.5km on the westbound carriageway (east of Ravenswood Roundabout) for 12 hours a day, until such time as air quality emissions would no longer result in an adverse effect. The new traffic model scenarios included:

- In 2015: all lane running with speed restricted to 60mph through Junction 4 for 4km on the eastbound carriageway and 4.5km on the westbound carriageway (east of Ravenswood Roundabout) 12 hours a day;
- In 2019: all lane running with speed restricted to 60mph through Junction 4 for 4km on the eastbound carriageway and 4.5km on the westbound carriageway (east of Ravenswood Roundabout) 12 hours a day;
- In 2019: all lane running, national speed limit (70mph); and
- In 2030: all lane running, national speed limit (70mph).

2.5.3 The scenarios for 2019 with the aim of demonstrating when, in the future, the 12 hour speed control to 60mph could be removed.

2.5.4 The results of the air quality and noise assessments, based on the above traffic model scenarios, are reported in Chapters 5 and 10 of this EAR.

2.5.5 The model for the Core traffic scenario included land use developments which were deemed 'near certain' or 'more than likely to occur', in addition to recent land use developments which had already been completed. Further details can be found in the Traffic Forecasting Report.

2.6 Design and Construction Assumptions

2.6.1 Due to the accelerated delivery required to encourage economic growth, this EAR has been undertaken based on the Outline Design for the Scheme, as available at Target Cost, and prior to completion of Detailed Design, which is currently on-going. For this reason, some of the above details with regards to the Scheme design may be subject to change, however the key features as described are considered to be sufficient to support a robust assessment of the potential environmental impacts of the Scheme, as reported in this EAR.

2.7 References

Defra, March 2010, Noise Action Plan Major Roads (outside first round agglomerations) Environmental Noise (England) Regulations 2006, as amended.

Department of Transport, March 2008, Advanced Motorway Signalling and Traffic Management Feasibility Study, A Report to the Secretary of State for Transport, DfT.

Highways Agency, 2013, Interim Advice Note 161/13 Managed Motorway Requirements – All Lane Running.

Highways Agency, 2013b, M3 Junction 2 to 4a Managed Motorway, Specification Series 500, Report No. 47065129-URS-06_SP-HD-500-3F, August 2013.

Highways Agency, 2013c, M3 Junction 2 to 4a Air Quality Mitigation Options Review, Technical Note 47065129-URS-05-TN-EN-014.

Highways Agency, January 2013, Traffic Forecasting Report, Ref No. 1044049-D04-005.

HM Treasury, Autumn Statement 2011, November 2011, Her Majesty's Stationary Office.

3. ALTERNATIVES CONSIDERED

3.1 Design Options Considered During SGAR1 – Options Identification

3.1.1 Initial Options Phase preparatory work for improvements to the M3 J2 to 4a considered a single Dynamic Hard Shoulder (DHS) Option in line with Interim Advice Note (IAN) 111/09 (Highways Agency, November 2009). However, following an Office of Government Commerce Stage 1 review in October 2009, (which recommended a strategic review of the programme and Options Stage), several alternative options were assessed and ranked. The key challenges for the M3 J2 to 4a MM (now SM-ALR) from a design point of view are listed below:

- Chobham Common SPA and SSSI between chainage 6300 and 8100 centres on environmental issues relating to potential physical impact on this designated ecological site from construction and traffic related impacts causing disturbance to the sensitive habitat as well as potential increases in air pollution;
- Integration with the current design of the M3 at Junction 2 with the M25 slip roads;
- The on-road operation and maintenance implications from having no hard shoulder;
- The Scheme operational interface with the existing M25 Controlled Motorway;
- Minimising the environmental and traffic impacts where practical during the construction and operation of the Scheme; and
- The relatively isolated nature of the Scheme extent from other SM schemes thereby presenting the issue of connectivity to the existing non-controlled motorways, which could lead to traffic pinch points.

3.1.2 The initial options phase preparatory work considered four operational regimes for the Scheme extent:

Table 3.1: Full Scheme Assessed at SGAR1

Option	Description
Option 1: IAN 111/09 solution	Dynamic Hard Shoulder (DHS) Operating Regime utilising the hard shoulder as a running lane during peak periods or for event management.
Option 2: Cantilever message signs (MS4s) with bookend gantries	DHS Operating Regime with gantries at the beginning and end of links (book end gantries). Inter-visibility achieved through MS4s at a nominal distance of 800m. Two MS4s in both directions within Chobham Common.
Option 3: All Lane Running ALR	ALR incorporates the controlled use of the hard shoulder as a continuous running lane. Information would be provided at nominal 800m intervals along the main Scheme section. With this option no gantries were located within the Chobham Common section.

Option	Description
Option 4: Light MS4s more widely spaced with no bookend gantries	DHS Operating Regime utilising absolute minimal infrastructure that could be implemented in order to operate DHS whilst meeting the overall objectives of the Scheme. Option relies on the intuitive behaviour of the motorist, with MS4s more widely spaced (at intervals of up to 3km). No infrastructure would be needed within Chobham Common.

3.1.3 To address potential environmental issues at Chobham Common (see above), two additional options were considered for that section of the M3.

Table 3.2: Chobham Common Options Assessed at SGAR1

Option	Description
Option 5: Non Inter-visibility Solution – IAN 111/09 philosophy (No gantries along the Chobham Common section)	DHS Operating Regime which is a modified IAN 111/09 solution. Philosophy of IAN 111 is followed without providing operational inter visibility as no gantries would be installed across Chobham Common. Option relies on the intuitive behaviour of the motorist.
Option 6: MMX – Cantilever MS4s with Central Reserve Mounted AMLs	ALR Operating Regime with gantries positioned at either end of each link with MS4s in between to meet inter-visibility requirements. The status of the hard shoulder will be displayed on MS4s provided at nominal 800m intervals.

3.2 Further Scheme Development

3.2.1 Following investigation of the options listed in Table 3.1 and Table 3.2, the M3 J2 to 4a project team undertook a value engineering (VE) exercise whilst still retaining MM benefits. The output of the VE process was the proposal for Managed Motorway All Lanes Running (now referred to as Smart Motorway All Lanes Running), which incorporates reduced infrastructure for the ALR operating regime as described below.

3.3 Smart Motorway All Lanes Running (SM-ALR)

3.3.1 The infrastructure associated with the SM-ALR design for the M3 J2 to 4a is listed below:

- No hard shoulder with lane 1 operating as a full time running lane. Primary and, where appropriate additional signal gantries in each SM-ALR link typically at a maximum of 2.8 mile (4.5km) intervals.
- Link cantilever MS4s with lane availability and mandatory speed limit displays at maximum 0.93 miles (1.5km) intervals between the gantries.
- Conditioning and termination cantilever MS4s at the beginning and end of each scheme.
- Continuation cantilever MS4s intra junction.

- 3.3.2 Assessment undertaken at SGAR1 in December 2011 concluded that SM-ALR would have the lowest environmental impact when compared to other Scheme options assessed at that stage.
- 3.3.3 In March 2012, IAN 161/12 Managed Motorways All Lanes Running was published by the Highways Agency. This effectively, consolidated the Highways Agency's requirements for MM ALR. IAN 161/12 was superseded by IAN 161/13 in August 2013. The M3 J2 to 4a Scheme assessed in this EAR has been developed to take account of the IAN 161/12 requirements as amended by IAN 161/13.

3.4 References

Highways Agency, August 2013, Interim Advice Note 161/13 Managed Motorways All Lane Running.

Highways Agency, November 2011, Interim Advice Note 111/09 Managed Motorway Implementation Guidance – Hard Shoulder Running.

4. ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

4.1 General

4.1.1 The Scheme has been subject to an environmental assessment to identify its likely environmental impacts and to determine whether the Scheme would give rise to significant effects. This chapter presents an overview of the environmental assessment process whilst the findings of the environmental assessment are recorded in the following chapters.

4.2 Scoping

4.2.1 An Environmental Assessment Scoping Report prepared in January 2013, (Highways Agency, 2013) supported that the Scheme is not likely to result in significant environmental effects and therefore a statutory EIA would not be required. It identified that further simple and detailed level assessments under the DMRB methodology were required for several environmental topics. The assessments scoped in and presented in this non-statutory Environmental Assessment Report are as follows:

- Air Quality – Simple Assessment;
- Cultural Heritage – Detailed Assessment;
- Landscape Effects – Detailed Assessment;
- Nature Conservation – Detailed Assessment;
- Materials – Simple Assessment; and
- Noise and Vibration – Detailed Assessment.

4.2.2 Geology and Soils, Effects on All Travellers, Community and Private Assets and Road Drainage and the Water Environment were identified as not requiring any further assessment following this scoping exercise, and so were scoped out of any further assessment.

4.2.3 The Scoping Report identified the topics to be covered in this Environmental Assessment Report on the basis that the following would be addressed:

- Features of environmental importance that could be affected by the Scheme are investigated and evaluated;
- Analysis of the impacts and potential effects during construction and operation are undertaken to the necessary level of detail;
- Appropriate mitigation measures are identified;
- The significance of effects are assessed; and
- Cumulative effects are considered, where appropriate.

4.3 Environmental Consultation

4.3.1 The opinions of the statutory environmental consultees (Natural England, Environmental Agency, English Heritage, Surrey Wildlife Trust and relevant local councils among others) were sought on the proposed scope of the EAR. As consultations usually take place after publication of the Scoping Report, the Scoping Responses are taken into consideration during environmental assessment. The principal issues raised are summarised in Table 4.1 below.

Table 4.1: Summary of Consultation Responses on the EAR Scoping Report

Consultee	Summary of Issue Raised	Where addressed in EAR
Rushmoor Borough Council	Rushmoor's AQMA no longer exists; it was revoked in August 2011. However, if the Scheme results in exceedance of the nitrogen dioxide EU limit value, this would trigger a re-declaration of the AQMA. If this is the case, consider producing an Air Quality Action Plan, along with additional monitoring and reporting requirements.	Chapter 5 Air Quality
	Description of air quality impact assessment methodology required, including modelling software and base year used.	Chapter 5 Air Quality
	Description of noise impact assessment methodology required, including modelling software.	Chapter 10 Noise and Vibration
Surrey Wildlife Trust	Consider the combined effect of noise and visual impacts of the Scheme on landscape value and recreational enjoyment of Chobham Common.	Chapter 12 Assessment of Cumulative Effects
	Consider noise impacts of Scheme on Chobham Common and on SPA breeding birds in particular. Consider erecting panel fencing and undertaking noise reducing surfacing and re-surfacing as mitigation measures.	Chapter 8 Nature Conservation Chapter 10 Noise and Vibration
	Confirmation of measures present to contain salt and oil residue in runoff from the M3.	Chapter 2 The Scheme – Section 2.4
	Provide NO ₂ data collected, in particular in the Chobham Common area. Provide further information on measures to be taken to reduce levels to within the recommended thresholds, if necessary.	Chapter 5 Air Quality Chapter 8 Nature Conservation
	Provide any species data collected in particular in the Chobham Common area.	Chapter 8 Nature Conservation
	Appropriate measures to mitigate construction phase impacts on Chobham Common are required.	Chapter 8 Nature Conservation
	Consider measures to reduce current NO ₂ levels to within the recommended thresholds.	Chapter 5 Air Quality
Runnymede Borough Council	Detailed assessment of noise impacts on residential dwellings within Runnymede Borough Council area is required; gaps in information should be addressed.	Chapter 10 Noise and Vibration
	Consider noise impacts during peak and/or sensitive times.	Chapter 10 Noise and Vibration
	Appropriate noise mitigation measures are required.	Chapter 10 Noise and Vibration
	Identify and assess impacts of Emergency Refuge Areas.	Chapter 2 The Scheme
	Consider the cumulative impacts of reasonably foreseeable strategic developments. Consider the impacts of the Scheme on residents of known future developments (the DERA development in particular).	Chapter 12 Assessment of Cumulative Effects

Consultee	Summary of Issue Raised	Where addressed in EAR
Hart District Council	Habitats Regulation Assessment for the Thames Basin Heaths Special Protection Area is necessary and appropriate.	Chapter 8 Nature Conservation
	Identify and assess impacts of any construction compound that may need to be set up in Hart District.	Chapter 2 The Scheme. Note that where compound locations are unknown at the time of writing and/or separate planning permission submissions would be required, these are not covered by this EAR.
Hampshire County Council	Consider assessment of impacts on undesignated heritage assets.	Chapter 6 Cultural Heritage
	Identify and assess impacts of haul routes and compound storage sites.	Chapter 2 The Scheme. Note that where compound locations are unknown at the time of writing and/or separate planning permission submissions would be required, these are not covered by this EAR.
	Description of traffic estimation methodology.	Chapter 2 and Highways Agency, Traffic Forecasting Report, January 2013.
	Assessment of traffic impacts on the local network (especially on the A327 and A331) as well as on the operation of junctions affected is required.	Highways Agency, Traffic Forecasting Report, January 2013.
	During construction, consider diversion routes and impacts on those.	Where necessary and agreed during construction and agreed with police and local highway authority.
	Detail construction impacts on PROWs.	There may be a requirement to temporarily close some Public Rights of Way to allow works to be undertaken on a number of underbridges (e.g. Rushy Pond Subway). Where closure or diversions to PROWs are required, the Contractor will be responsible for ensuring that the required notices are posted in advance and that any disruption to non-motorised users is minimised. Locations of construction compounds were not confirmed at the time of writing and could therefore not be assessed. Should locations selected by the Contractor affect PROWs, the Contractor will be responsible for ensuring that the required notices are posted in advance and that any disruption to non-motorised users is minimised.

Consultee	Summary of Issue Raised	Where addressed in EAR
Environment Agency	No comments	-
Natural England	No comments	-
English Heritage	No comments	-

4.4 Methodology of the Environmental Assessment Report

4.4.1 Environmental assessment has been carried out following guidance and standards provided in DMRB Volume 11 Section 2 Parts 4 and 6, and Interim Advice Note (IAN) 126/09, in line with the HA80 EIA Regulations. The approach to the assessment is consistent with current DMRB as modified by Interim Advice Notes.

4.4.2 Other specialist methodologies and good practice guidelines have been drawn upon as necessary (e.g. New Approach to Appraisal and methods specified on the Department for Transport (DfT) Transport Analysis Guidance website – www.webtag.org.uk). Proven techniques have been used wherever possible in order to avoid developing unique and untested procedures.

4.4.3 The methodologies for each of the topics are detailed within the specialist chapters.

4.5 Establishment of the Baseline Environment

4.5.1 The Interim Environmental Assessment Report (Highways Agency, April 2012) was referred to as a source of information, together with associated survey reports referenced within that report. This was supplemented with additional surveys and desk study information, which is detailed in the individual Environmental Assessment chapters of the report presented herein.

4.6 Impact Identification and Assessment

4.6.1 Scheme activities that may give rise to impacts and effects during the construction and operational phases will be considered within the assessment. During the construction phase these may include:

- Temporary offices, compounds, storage areas and worksites;
- Temporary accesses and haul routes;
- Removal of some existing infrastructure (i.e. signs, safety barriers, etc.);
- Vegetation clearance;
- Soil removal;
- Ground and excavation works; and
- Routing of services and utilities.

4.6.2 Activities during the operational phase of the Scheme will include:

- Changes in traffic flow; composition and the use of hard shoulder (potential for consequential changes to noise and air quality);
- Locations of new SM-ALR infrastructure potentially resulting in visual impacts; and
- Use of ERAs.

- 4.6.3 Impacts of the Scheme can be positive or negative; direct or indirect; short term or long term, and/or cumulative. Direct impacts are directly attributable to the Scheme. Indirect impacts result indirectly as a consequence of the Scheme, arising via a complex route, where the connection between the Scheme and the impact is complicated, unpredictable or remote.
- 4.6.4 The Scheme will have two principal phases:
- Construction phase – impacts within this phase are usually short term and reversible.
 - Operational phase – impacts within this phase are usually long term and caused by every day operation of the Scheme. Short term impacts may also arise during maintenance works or traffic management operations.
- 4.6.5 Operational phase effects are assessed on the basis of the following future baseline scenarios:
- Short term – opening year (2015).
 - Long term – design year (15 years following opening – 2030).
- 4.6.6 Cumulative impacts are assessed in this Environmental Assessment Report as resulting from the accumulation of multiple effects at a specific location or asset. Cumulative impacts may also arise from the combined effect of activities associated with the Scheme together with other development projects in the area.
- 4.6.7 The Scheme design has been developed in parallel with the environmental assessment, and therefore environmental mitigation is incorporated into the design. As such this assessment report considers the effects that would remain as residual effects after the proposed design mitigation measures have been implemented.
- 4.7 Significance of Effects**
- 4.7.1 DMRB Volume 11, Section 2, Part 5, HA205/08 states that “the significance of the effect is formulated as a function of the receptor or resource environmental values (or sensitivity) and the magnitude of project impact (change)”. This process includes the following stages:
- Assigning environmental value.
 - Assigning a magnitude of impact.
 - Assigning a significance level.
- 4.7.2 Significance is assigned with mitigation in place. The overall significance of effect is calculated by use of the following matrix.

Table 4.2: Matrix for Determination of Significance of Effect

Magnitude of Impact	Value of Receptor				
	Very High	High	Medium	Low	Negligible
Major	Very Large	Large/Very Large	Moderate/Large	Slight/Moderate	Slight
Moderate	Large/Very Large	Moderate/Large	Moderate	Slight	Neutral/Slight
Minor	Moderate/Large	Slight/Moderate	Slight	Neutral/Slight	Neutral/Slight
Negligible	Slight	Slight	Neutral/Slight	Neutral/Slight	Neutral
No change	Neutral	Neutral	Neutral	Neutral	Neutral

4.7.3 Effects are generally considered significant (and in need of mitigation) if they are Very Large, Large and Moderate. Slight and Neutral effects are not considered to be significant. However, slight effects should be considered in the context of improving the design of the Scheme. A No Change magnitude of impact will always result in a Neutral effect. Slight/Moderate effects are borderline cases that would be determined based on professional judgement, taking account of whether effects are considered to be positive or negative, permanent or temporary, direct or indirect, the duration/frequency of the effect and whether any secondary effects are caused.

4.7.4 Significance criteria from DMRB Volume 11, Part 2 are employed where specified within the environmental topic chapters. Where appropriate, the topic-specific criteria have been adopted from institute guidelines or best practice. For some disciplines, predicted effects may be compared with quantitative thresholds and scales in determining significance. Where quantitative measures may not be applied, qualitative criteria derived from DMRB have been utilised.

4.8 Environmental Mitigation

4.8.1 The environmental assessment process has helped inform the Scheme design and aid in the development of appropriate mitigation measures. This is an iterative process that seeks to reduce the severity of the impacts and increase the potential for successful mitigation measures to be fully incorporated into the Scheme. The residual effects assessment takes these mitigating measures into account.

4.9 Consultation

4.9.1 The following have been consulted on this EAR with relevant comments being provided:

- Hart District Council;
- Hampshire County Council;
- Runnymede Borough Council;
- Rushmoor Borough Council;
- Surrey Heath Borough Council;
- Surrey County Council;
- Hampshire and Isle of Wight Trust;
- Surrey Wildlife Trust;

- Natural England;
- English Heritage; and
- Environment Agency.

4.9.2 The comments received are contained within Appendix 4.1. These comments have been considered and mitigation measures have been included, points have been clarified and further information has been provided where required (refer to Appendix 4.1).

4.9.3 Further comments by Runnymede Borough Council have recently been received which relate to noise impacts on a residential mobile home site located immediately adjacent to the highway boundary (around chainage 3050 on the eastbound carriageway). Additional noise modelling is being carried out to chainage 2940-3100 to establish whether noise levels in this area warrant an extension of the proposed noise barrier by an additional 100m.

4.10 Report Structure

4.10.1 This EAR has been produced following the guidance and standards given in DMRB Volume 11, Section 2, Part 6 Reporting of EIAs.

4.10.2 This EAR comprises three volumes:

- Volume 1 – Main Report,
- Volume 2 – Figures, and
- Volume 3 – Technical Appendices (supporting information).

4.10.3 Other supporting information, such as survey reports, are available separately through the Highways Agency's freedom of information process.

4.10.4 Chapters for each topic in Part 1 include:

- Introduction;
- Regulatory/Policy;
- Study Area;
- Baseline Conditions and Value of Resource;
- Mitigation and Detailed Scheme Development;
- Magnitude of Impacts;
- Significant effects (including cumulative);
- Limitations of Assessment; and
- Summary.

4.11 References

Design Manual for Roads and Bridges, available at:
<http://www.dft.gov.uk/ha/standard/dmrb>.

Highways Agency, 2013, Interim Advice Note 161/13 Managed Motorway Requirements – All Lane Running.

Highways Agency, January 2013, Traffic Forecasting Report, Ref No. 1044049-D04-005.

Highways Agency, October 2009, Interim Advice Note 129/09 Environmental Impact Assessment: Reporting of Determination and Publication of Notices.

5. AIR QUALITY

5.1 Introduction

5.1.1 This chapter considers the potential air quality effects of the Scheme on local and regional air quality.

5.1.2 The chapter considers both temporary (i.e. construction) and permanent effects for air quality.

5.2 Regulatory/Policy Framework

Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (the CAFE Directive) and the Air Quality Standards Regulations 2010

5.2.1 The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the EU and merged much of the existing air quality legislation into a single legal directive, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008). This act incorporated:

- The EU Framework Directive 96/62/EC on ambient air quality assessment and management;
- The associated Daughter Directives: 1999/30/EC, 2000/69/EC and 2002/3/EC which together set out objectives and long term target values for pollutant concentrations in ambient air; and
- Council Decision 97/1010/EC which established the exchange of information and data from networks and individual stations measuring ambient air pollution within member states.

5.2.2 The new Directive 2008/50/EC also introduces the following:

- New air quality objectives for PM_{2.5} (fine particles) including the limit value and exposure related objectives - exposure concentration obligation and exposure reduction target;
- The possibility to discount natural sources of pollution when assessing compliance against limit values; and
- The possibility for time extensions of three years (PM₁₀) and for up to five years (NO₂, benzene) for complying with limit values, based on conditions and an assessment by the European Commission.

5.2.3 Directive 2008/50/EC is currently transcribed into UK legislation by the Air Quality Standards Regulations 2010 which came into force on 11 June 2010. Limit Values for the protection of human health are presented in Table 5-6.

5.2.4 Air Quality Strategy for England, Scotland, Wales and Northern Ireland and Air Quality (England) Regulations 2000 and Air Quality (England) (Amendment) Regulations 2002.

5.2.5 The UK Government and the Devolved Administrations (DAs) published the latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) in July 2007 (Defra, 2007) defining both Standards and Objectives for each of a range of air pollutants.

- 5.2.6 The 'Objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of the costs, benefits, feasibility and practicality of achieving the standards. The objectives are prescribed within The Air Quality (England) Regulations 2000 and The Air Quality (England) (Amendment) Regulations 2002 (together termed the 'Regulations'). Air Quality Objectives included in the Regulations and current legislation which are relevant to the study (nitrogen dioxide (NO₂) and particulate matter (PM₁₀) are outlined in Table 5.1.
- 5.2.7 The UK's AQS objectives are equal to, or more stringent than, the EU Limit Values (no Member State may promulgate air quality standards that are weaker than the EU Limit Values). The CAFE Directive Limit Values are also included in Table 5.1.

Table 5.1: Air Quality Legislation

Pollutant	Objective/Limit Value	Measured as	Date to be achieved by and maintained thereafter		
			AQS	Regulations	2008/50/EC
PM ₁₀	50 µg/m ³ Not to be exceeded more than 35 times per year	24 Hour Mean	31-Dec-04	31-Dec-04	1-Jan-05
	40 µg/m ³	Annual Mean	31-Dec-04	31-Dec-04	1-Jan-05
NO ₂	200 µg/m ³ Not to be exceeded more than 18 times per year	1 Hour Mean	31-Dec-05	31-Dec-05	1-Jan-10
	40 µg/m ³	Annual Mean	31-Dec-05	31-Dec-05	1-Jan-10

- 5.2.8 The Air Quality Objectives only apply where members of the public are likely to be regularly present for the averaging time of the objective (i.e. where people will be exposed to pollutants). The annual mean objectives apply to all locations where members of the public might be regularly exposed; these include the building façades of residential properties, schools, hospitals, care homes, etc. The 24 hour mean objective applies to all locations where the annual mean objective would apply, together with hotels and gardens of residential properties². The 1 hour mean objective also applies at these locations as well as at any outdoor location where a member of the public might reasonably be expected to stay for 1 hour or more, such as shopping streets, parks and sports grounds, as well as bus stations and railway stations that are not fully enclosed.
- 5.2.9 Measurements across the UK have shown that the 1 hour mean NO₂ objective is unlikely to be exceeded unless the annual mean NO₂ concentration is greater than 60 µg/m³. Thus exceedances of 60 µg/m³ as an annual mean NO₂ concentration are used as an indicator of potential exceedances of the 1 hour mean NO₂ objective.

² Such locations should represent parts of the garden where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

- 5.2.10 Similarly, the guidance document LAQM.TG(03) (Defra, 2003) sets out the method by which the number of days in which the PM₁₀ 24-hr objective is exceeded can be obtained based on a relationship with the predicted PM₁₀ annual mean concentration. This same relationship is also presented in LAQM.TG(09).
- 5.2.11 The UK air quality objectives for the protection of vegetation set in relation to oxides of nitrogen (NO_x) are shown in Table 5.2.

Table 5.2: Air Quality Objectives and Limit Value for the Protection of Vegetation Set in Relation to NO_x

Pollutant	Measures as	AQS/Limit value
NO _x	Annual Mean	30µg/m ³

- 5.2.12 Additionally, the United Nations Economic Commission for Europe (UNECE) has set Critical Loads for nitrogen deposition (N-deposition) for specific sensitive ecosystems. Critical Loads are defined by the UNECE as 'a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge'.
- 5.2.13 The Critical Load thresholds for each of the N sensitive Designated Sites identified within the study area (see section 5.3) is shown in Table 5.3.

Table 5.3: Ecosystem Critical Loads to N-deposition

Ecosystem	Deposition Load Measured as	Critical Measured as
Foxlease and Ancell's Meadows north SSSI	10 to 20 kg N ha ⁻¹ y ⁻¹	Annual Critical Load
Foxlease and Ancell's Meadows south SSSI	10 to 20 kg N ha ⁻¹ y ⁻¹	Annual Critical Load
Colony Bog and Bagshot Heath SSSI	10 to 15 kg N ha ⁻¹ y ⁻¹	Annual Critical Load
Chobham Common SSSI	5 to 15 kg N ha ⁻¹ y ⁻¹	Annual Critical Load
Thursley, Ash, Pirbright and Chobham SAC	10 to 15 kg N ha ⁻¹ y ⁻¹	Annual Critical Load
Staines Moor SSSI	20 to 30 kg N ha ⁻¹ y ⁻¹	Annual Critical Load

The Environmental Protection Act 1990 (EPA)

- 5.2.14 Dust and air pollution can cause nuisance affecting properties and the public adjacent to a construction site and can also adversely affect other environmental receptors including watercourses and ecological receptors. In addition there are statutory objectives in relation to NO₂ and PM₁₀ which have known health impacts.

- 5.2.15 The EPA, in part III, contains a definition of what constitutes a 'statutory nuisance' with regard to dust, and places a duty on Local Authorities to detect any such nuisances within their area. Section 79 of the Act further defines 'Best Practicable Means' (BPM) as "reasonably practical having regard, among other things, to local conditions and circumstances, to the current state of technical knowledge and to the financial implications".
- 5.2.16 It also defines a number of factors relating to dust and air pollution which constitute a statutory nuisance (Section 79). This includes:
- Smoke emitted from premises so as to be prejudicial to health or a nuisance;
 - Fumes or gases emitted from premises so as to be prejudicial to health or a nuisance;
 - Any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance; and
 - Any accumulation or deposit which is prejudicial to health or a nuisance.
- 5.2.17 To note that in the current assessment, "premises" are to be understood in the context of the "construction area" of the proposed Scheme. These would be specific construction site locations or the entire area within the red line boundary³.
- 5.2.18 Local Authorities have the power under Section 80, Chapter 43, Part III of the EPA (Summary Proceedings for Statutory Nuisances) to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.
- 5.2.19 Dust arising from construction works could lead to statutory nuisance if it "interferes materially with the well-being of the residents, i.e. affects their well-being, even though it may not be prejudicial to health".
- 5.2.20 A typical example of statutory nuisance is dust produced by construction and demolition work, resulting from activities such as earthworks, the cutting of materials and in particular, vehicles using haul roads which results in re-suspension of deposited dust.

National Planning Policy Framework

- 5.2.21 The National Planning Policy Framework (NPPF) (Department for Communities and Local Government, 2012) published in 2012 sets out the Government's planning policies for England and how these are expected to be applied. The NPPF revokes forty four planning documents including: Planning Policy Statement 23: Planning and Pollution Control.
- 5.2.22 The Conserving and enhancing the natural environment section (Section 11) of the NPPF considers air quality and pollution. In the NPPF pollution is described as:
- 'Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light.'*

³ Premises are land and buildings together.

- 5.2.23 The following paragraphs (paragraphs: 109 bullet point 4, 110, 120 and 124) from NPPF Section 11 consider air quality and pollution:

‘The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and...’

‘In preparing plans to meet development needs, the aim should be to minimise pollution and other adverse effects on the local and natural environment. Plans should allocate land with the least environmental or amenity value, where consistent with other policies in this Framework.’

‘To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. ...’

‘Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative effects on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan.’

- 5.2.24 The NPPF is also accompanied by Technical Guidance to the National Planning Policy Framework (NPPF-TG) (Department for Communities and Local Government, 2012). This document does not include any specific guidance for the assessment of air quality effects from road schemes.

Local Planning Policy

- 5.2.25 In addition to the national planning policy framework there are also local planning documents which set out local planning policies. These are presented for the local authorities within the detailed air quality study area (see section 5.3).

Hart District Council

- 5.2.26 The Hart District Council Core Strategy (Hart District Council, 2012) includes policy CS13: Transport which requires: ‘Development that would generate a significant transport impact will be required to: Minimise the impact of all forms of traffic on the environment and help tackle climate change.’
- 5.2.27 The Hart District Council Local Development Framework (Hart District Council, 2009) does not include policies specifically regarding air quality.
- 5.2.28 There is no Air Quality Action Plan (AQAP) for Hart District Council because no Air Quality Management Areas (AQMAs) have been declared in their administrative area.

Rushmoor Borough Council

- 5.2.29 The Rushmoor Borough Council Core Strategy (Rushmoor Borough Council, 2011) Considers air quality through Policy CP16 – Reducing and Managing Travel Demand. The policy notes that: *‘The Council will work with Hampshire County Council, the Highways Agency, and other partners on a cross-boundary basis where appropriate, to ensure that development proposals are permitted subject to: G: Taking appropriate measures to avoid adverse impact on air quality, including on European nature conservation sites.’*
- 5.2.30 The Rushmoor Local Development Scheme (Rushmoor Borough Council, 2012a) does not include specific air quality policies.
- 5.2.31 There is no Air Quality Action Plan (AQAP) for Rushmoor Borough Council because no Air Quality Management Areas (AQMAs) have been declared in their administrative area.

Surrey Heath Borough Council

- 5.2.32 The Surrey Heath Borough Council LDS (Surrey Heath Borough Council, 2012) and the Surrey Heath Borough Council Core Strategy (Surrey Heath Borough Council, 2011) have been reviewed to identify specific air quality policies. No specific policies were identified.
- 5.2.33 The latest Surrey Heath AQAP (Surrey Heath Borough Council, 2007) notes that progress had been made between 2005/06 in improving air quality through:
- *‘Using liaison forums the concept of travel plans has been promoted and explained to both businesses and schools.*
 - *The walking project has been initiated and the cycle network expanded.*
 - *All the council diesel vehicles now specified to be fitted with to at least Euro 4 standard.*
 - *All new developments within the AQMAs are scrutinised for the effects of and to air quality and appropriate conditions imposed.’*

Runnymede Borough Council

- 5.2.34 Local Plan (Runnymede Borough Council, 2001) and Local Development Framework (LDF) (Runnymede Borough Council, 2008) have been reviewed. The LDF considers air quality through Policy NRM7: Air Quality:

‘Local authorities and other relevant bodies should seek an improvement in air quality in their areas so that there is a significant reduction in the number of days of medium and high air pollution by 2026. Local Development Documents and development control can help to achieve improvements in local air quality through:

I: Ensuring consistency with Air Quality Management Plans.

II: Reducing the environmental impacts of transport and congestion management, and support the use of cleaner transport fuels.

III: Mitigating the impact of development and reduce exposure to poor air quality through design, particularly for residential development in areas which already, or are likely to, exceed national air quality objectives.

IV: Encouraging the use of best practice during construction activities to reduce the levels of dust and other pollutants.’

Spelthorne Borough Council

- 5.2.35 The Spelthorne Core Strategy (Spelthorne Borough Council, 2009) considers air quality in two policies: Strategic Policy SP6: Maintaining and Improving the Environment and Policy EN3: Air Quality.
- 5.2.36 Strategic Policy SP6: Maintaining and Improving the Environment indicates that: The Council will seek to maintain and improve the quality of the environment of the Borough. It will: b) Contribute to improving air quality in the Borough.
- 5.2.37 Policy EN3: Air Quality notes that: "The Council will seek to improve air quality of the Borough and minimise harm from poor air quality by:
- a) *Supporting measures to encourage non-car based means of travel.*
 - b) *Supporting appropriate measures to reduce traffic congestion where it is a contributor to existing areas of poor air quality.*
 - c) *Requiring an air quality assessment where development:*
 - I: is in an AQMA, and*
 - II: generates significant levels of pollution, or*
 - III: increases traffic volumes or congestion, or*
 - IV: is for non-residential uses of 1000m² or greater, or*
 - V: is for 10 or more dwellings, or*
 - VI: involves development sensitive to poor air quality.*
 - d) *Refusing development where the adverse effects on air quality are of a significant scale, either individually or in combination with other proposals, and which are not outweighed by other important considerations or effects and cannot be appropriately and effectively mitigated.*
 - e) *Refusing development where the adverse effects of existing air quality on future occupiers are of a significant scale which cannot be appropriately or effectively mitigated and which are not outweighed by other material considerations.'*

The Royal Borough of Windsor and Maidenhead

- 5.2.38 The Local Plan (Royal Borough of Windsor and Maidenhead, 2001) and Core Strategy (Royal Borough of Windsor and Maidenhead, 2003) do not include specific mention of air quality policies related to vehicle emissions.
- 5.2.39 The 2011 Progress Report (Royal Borough of Windsor and Maidenhead, 2011) indicates that there is action plan progress with:
- *'Lift sharing: to develop an area-wide lift-sharing. Progress has been made due to the include of this scheme into the borough-wide scheme as part of Local Sustainable Transport Fund bid.*
 - *Urban Traffic Control: updating and extending the current Urban Traffic Control in conjunction with better traffic surveys. Progress includes installation of a new Urban Traffic Control system and server with improved system capabilities.*

- *Junction Improvements: Modifying the layout of junctions experiencing chronic congestion. Progress to date includes: the redesign of Clarence Road roundabout in Windsor to improved traffic flow, Maidenhead town centre road network was modelled to inform the Maidenhead Area Action Plan. In the Maidenhead Area Action Plan a number of improvements are proposed for key junctions as well as the completion of the Stafferton Link Road, to reduce traffic around the town centre.*
- *Supported bus services: providing financial support to local bus services. Progress to date includes the Council's investment of £800,000 per annum to support a network of local bus services.*
- *Park & Ride: Exploring opportunities for park and ride. Progress to date includes the securing of funding for small-scale park and ride sites in Windsor. Weekend parking at Centrica and possible at Windsor Racecourse.'*

5.3 Study Area

- 5.3.1 The Scheme will create a 'Smart Motorway' between Junctions 2 and 4a of the M3. This includes the provision of additional traffic capacity through the conversion of the hard shoulder to a traffic running lane between Junctions 2 and 4a. A full description of the Scheme is provided in Chapter 2.
- 5.3.2 This air quality section considers operational air quality effects within two study areas. One operational study area relates to 'local air quality' and one relates to 'regional air quality'.
- 5.3.3 The operational local air quality study area also considers the Scheme route and those routes considered to be affected by the Scheme, as identified by comparing traffic data with (Do-Something) and without (Do-Minimum) the Scheme against the local air quality screening criteria presented within the Design Manual for Roads and Bridges Volume 11, Section 3, Part 1 'Air Quality' (HA207/07). These criteria are outlined below:
- Road alignment will change by 5m or more; or
 - Daily traffic flows will change by 1,000 annual average daily traffic (AADT) flow or more; or
 - Heavy Duty Vehicles (HDV) flows will change 200 AADT or more; or
 - Daily average speeds will change by 10km/hr or more; or
 - Peak hour speed will change by 20km/hr or more.
- 5.3.4 Those links which meet the criteria for Local Affected Roads are shown on Figure 5.3 in red. Air quality monitoring data and sensitive receptors that are within 200m of the Scheme or affected road network are considered in this EAR.
- 5.3.5 Selected additional links have also been included in the local operational air quality modelling. Additional links have been included where the additional emissions from these links are required to adequately describe pollutant concentrations at sensitive receptors located along with the Scheme or affected routes (i.e. those routes which meet the criteria listed in Paragraph 5.3.3).
- 5.3.6 The regional air quality study area is based on the regional screening criteria as presented in HA207/07 (paragraph 3.20 of HA207/07).
- 5.3.7 Construction air quality is also discussed for the Scheme route as required for locations within 200m (See paragraph 3.45 of HA207/07).

5.3.8 The Scheme corridor and affected road network runs through fifteen local authorities including:

- South Bucks District Council;
- Chiltern District Council;
- Basingstoke and Deane Borough Council;
- Hart District Council;
- Rushmoor Borough Council;
- Three Rivers District Council;
- Surrey Heath Borough Council;
- Runnymede Borough Council;
- Guildford Borough Council;
- Spelthorne Borough Council;
- London Borough of Hillingdon;
- Bracknell Forest Council;
- Slough Borough Council;
- The Royal Borough of Windsor and Maidenhead; and
- Wokingham Borough Council.

5.3.9 The Scheme corridor and the affected road network considered at a detailed level of assessment runs through the following six local authorities:

- Hart District Council;
- Rushmoor Borough Council;
- Surrey Heath Borough Council;
- Runnymede Borough Council;
- Spelthorne Borough Council; and
- The Royal Borough of Windsor and Maidenhead.

5.4 Methodology

5.4.1 The methodology for the air quality assessment is discussed below. The methodology has been divided into local operational assessment, plan level WebTAG assessment, regional assessment and construction assessment methodologies. The plan level assessment is a part of the local air quality assessment

Local Operational Assessment Methodology

5.4.2 This section described the general approach utilised to assess air quality effects for the Scheme. The assessment of potential air quality effects has been undertaken in accordance with the DMRB Volume 11, Section 3, Part 1 – Air Quality (HA207/07). This guidance follows a staged process of assessment. This guidance focuses on key road traffic pollutants such as nitrogen dioxide (NO₂) and particulates with a diameter of less than 10 µm (PM₁₀).

5.4.3 When monitoring data indicates exceedances of an air quality objective are likely in the opening year of Scheme, or proposals cannot be adequately assessed using the DMRB screening method spreadsheet, the assessment moves straight to a detailed level assessment. Otherwise, affected roads with relevant receptors within 200m should be taken to a simple level assessment or a detailed level of assessment.

- 5.4.4 A detailed level assessment utilises dispersion modelling to more accurately estimate the pollutant concentrations, taking into account additional variables that the DMRB Screening method does not. It is not always necessary to conduct a detailed level assessment for an entire study area; it is possible to combine detailed modelling for 'hot-spot' or complex areas with simple assessment for the wider network.
- 5.4.5 For this Scheme a combination of simple and detailed levels of assessment has been identified as necessary. Simple assessment has been used in wider areas away from the Scheme to confirm no wider likely significant effects are likely to occur. This has allowed focused detailed assessment works to be undertaken on key areas affected by the Scheme (e.g. Scheme route and adjoining routes e.g. M25). The key findings of the simple assessment are presented in Appendix 5.1.
- 5.4.6 The assessment has utilised the ADMS Roads dispersion model (version 3.1.0) to predict road pollutant contributions at the identified sensitive receptors. Modelling has been undertaken for the baseline year (2009), the opening year (2015) with and without Scheme, the opening year (2015) without Scheme and with Scheme and mitigation (60mph speed limit on M3), and 2019 with Scheme plus mitigation and with Scheme unmitigated (no 60mph speed limit).
- 5.4.7 The 2015 with mitigation scenario (7am to 7pm for a portion of the scheme) was considered in addition to the 2015 opening year scenario as the findings of initial modelling without mitigation in place predicted there to be changes of $>0.4 \mu\text{g}/\text{m}^3$ NO_2 at concentrations above the objective value ($40 \mu\text{g}/\text{m}^3$) at a potentially significant number of properties. Both sets of results are presented and discussed within this report.
- 5.4.8 The methodology outlined within Highways Agency Interim Advice Note 170/12 'Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 Air Quality', on the assessment of future NO_x and NO_2 projections has also been used in this assessment. The IAN sets out a method to allow consideration of Defra's advice on long term trends in roadside NO_2 concentrations (Defra, 2011), which suggests that there is now a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality as previously published in Defra's technical guidance and observed trends.
- 5.4.9 The methodology, known as Gap analysis, involved the completion of air quality modelling and verification in accordance with those methods outlined within HA 207/07 with reference to Defra's LAQM.TG(09) (Defra, 2009) guidance, to correct verified modelled total NO_2 concentrations. Then following verification of the modelled results, these are then adjusted to represent the observed long term trend (LTT) profile. This adjustment is completed using the IAN 170/12 HA LT Calculation spreadsheet (v1.1) as provided by the Highways Agency in support of the IAN. The adjusted results from this Gap analysis are those presented in this report.
- 5.4.10 The determination of significance for the local operational air quality assessment has been undertaken using methods set out in the Draft IAN 174/13 'Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07)'. In particular, Table 2.3 of this IAN provides guidance on the number of properties constituting a significant effect depending on the magnitude of change in pollutant concentrations predicted as a result of the proposed scheme.

- 5.4.11 Significance has been determined on the basis of long term trend (LTT) information as this is currently considered to be the most reasonable representation of future air quality in 2015 and 2019.
- 5.4.12 The evaluation of significance has also included information on compliance risks with the EU Air Quality Directive. This information has been derived using advice within Draft IAN 175/13 'Updated air quality advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for user of DMRB Volume 11, Section 3, Part 1 'Air Quality'.
- 5.4.13 Further details of the assessment methodology including the inputs used in ADMS-Roads (including meteorology data), model post-processing (e.g. NO_x to NO₂ conversion) and the approach taken to model verification are presented in Appendix 5.1. A CD of traffic data is available upon request from the Highways Agency.

Plan Level WebTAG Local Assessment Methodology

- 5.4.14 The DMRB air quality guidance document (HA207/07) also indicates that the assessment of air quality in relation to highways schemes should report the results of local air quality Transport Analysis Guidance (TAG) appraisal (plan level), as completed in line with the guidance set out by The Air Quality Sub Objective, TAG Unit 3.3.3 (Department for Transport, 2012).
- 5.4.15 The plan level methodology within the TAG guidance aims to quantify the change in exposure at properties in the opening year as a result of schemes, through the quantification of exposure for all DMRB local affected roads. The methodology follows a number of steps including:
- Identification of the affected road network, which is the same as the DMRB local air quality affected road network;
 - Quantification of the number of properties within 0-50m, 50-100m, 100-150m and 150-200m bands, from the affected roads;
 - The calculation of concentrations within each band at 20m, 70m, 115m and 175m from the road centreline using the DMRB spreadsheet model;
 - Calculation of property weighted NO₂ and PM₁₀ concentrations;
 - Calculation of the total numbers of properties that improve, worsen or stay the same; and
 - Calculation of an overall assessment score for NO₂ and PM₁₀.
- 5.4.16 An overall positive score indicates an overall worsening and an overall negative score indicates an overall improvement.

Regional Assessment Methodology

- 5.4.17 The regional assessment considers changes in annual road transport emissions of oxide of nitrogen (NO_x), PM₁₀ and Carbon (C) that may be brought about by the Scheme in the opening and design years.
- 5.4.18 The latest Emission Factor Toolkit (EFT v5.2) spreadsheet has been used in the estimation of these emissions.

- 5.4.19 DMRB HA207/07 regional scoping criteria have been applied to opening year traffic data and the design year (i.e. 15 years after opening) to define the regional affected road network (different to that for local air quality).
- 5.4.20 Roads that meet the following criteria have been included within the regional affected road network:
- A change of more than 10% AADT; or
 - A change of more than 10% to the number of heavy duty vehicles AADT; or
 - A change in daily average speed of more than 20 km/hr.
- 5.4.21 The scenarios modelled include: the existing base case (the traffic model base case); and future Do-Minimum and Do-Something in the opening year and design year.
- 5.4.22 The results of the regional assessment (annual emissions, change in emissions with the Scheme) have been presented in tabular format, together with interpretive text in Tables 5.13 and 5.14 in section 5.7.

Construction Assessment Methodology

- 5.4.23 Construction receptors along the Scheme have been identified and a qualitative discussion of the significance of impacts with suitable mitigation measures presented.

5.5 Baseline Conditions and Value of Resource

Air Quality Management Areas (AQMA)

- 5.5.1 This sub-section describes the AQMA As declared by the six districts within the detailed air quality study area. There are no AQMA declared by Hart District Council, and Rushmoor Borough Council.
- 5.5.2 There is one Air Quality Management Area (AQMA) declared by Surrey Heath Borough Council. This is:
- Surrey Heath AQMA – a strip of land from Frimley Road Camberley to Ravenswood Roundabout Camberley which embraces the M3 Motorway and the houses on both sides of the motorway for exceedances in annual mean nitrogen dioxide air quality objective, and 24-hour mean PM₁₀ air quality objective. This AQMA is located on the Scheme and affected road network.
- 5.5.3 There are two AQMAAs declared by Runnymede Borough Council. These are:
- Area 1 AQMA – An area extending 55m east and west of the centre line of the M25 between Junction 11 and 13 for exceedances in annual mean nitrogen dioxide and PM₁₀ air quality objective, and 24-hour mean PM₁₀ air quality objective. This AQMA is located on the Scheme and affected road network.
 - Area 2 AQMA – An area extending 70m east and west of the centre line of the M25 between Junction 11 and the southern boundary of the borough at New Haw/Byfleet for exceedances in annual mean nitrogen dioxide and PM₁₀ air quality objective, and 24-hour mean PM₁₀ air quality objective. This AQMA is located on the Scheme and affected road network.

- 5.5.4 There is one AQMA declared by Spelthorne Borough Council. This is:
- Spelthorne AQMA – An area encompassing the whole borough including the majority of Staines, Shepperton, Ashford and Sunbury-on-Thames; extending from west of the M25 in the northwest to the River Thames in the southeast for exceedances in annual mean nitrogen dioxide air quality objective. This AQMA is located on the Scheme and affected road network.
- 5.5.5 There are three AQMAs declared by the Royal Borough of Windsor and Maidenhead. These are:
- Bray/M4 AQMA – An area encompassing part of Bray around the place where the M4 crosses over the A308 London Road for exceedances of the annual mean air quality objective for nitrogen dioxide. This AQMA is located 9.5 kilometres north of Junction 2 of the M3.
 - Windsor AQMA - An area covering an enlarged area encompassing parts of Windsor Town Centre, from Oak Lane/Dedworth Road in the west, Althlone Square/Clarence Road/Bexley Road to the east, Imperial Road to the south, and Clewer Court Road and Stovell Road to the north for exceedances of the annual mean air quality objective for nitrogen dioxide. This AQMA is located. This AQMA is located 9.5 kilometres north of Junction 2 of the M3.
 - Maidenhead AQMA – an area covering part of Maidenhead Town Centre for exceedances of the annual mean air quality objective for nitrogen dioxide. This AQMA is located 18.5 kilometres north of Junction 3 of the M3.
- 5.5.6 There is one AQMA declared by South Bucks District Council. This is:
- South Bucks AQMA – An area comprising the M4, M25 and M40 and adjacent land, for exceedances of the annual mean air quality objective for nitrogen dioxide.
- 5.5.7 There is one AQMA declared by Chiltern District Council. This is:
- Chesham AQMA – An area encompassing buildings along parts of Broad Street and Berkhamstead Road in Chesham, for exceedances of the annual mean air quality objective for nitrogen dioxide. This AQMA is located 12 kilometres north of the nearest modelled road network on the M25.
- 5.5.8 There is one AQMA declared by The London Borough of Hillingdon Council. This is:
- Hillingdon AQMA – The area from the southern boundary north to the border defined by, the A40 corridor from the western borough boundary, east to the intersection with the Yeading Brook north until its intersection with the Chiltern-Marylebone railway line and then east along the railway line to the eastern borough boundary. Declared for exceedances of the annual mean air quality objective for nitrogen dioxide. This AQMA encompasses the M25 south of Junction 11 and M3 East of the M25.
- 5.5.9 There are two AQMAs declared by Bracknell Forest Borough Council. These are:
- Area 1: The Bagshot Road (A322) Horse and Groom Roundabout Downshire Way AQMA. Declared for exceedances of the annual mean air quality objective for nitrogen dioxide. This AQMA is located 6km north west of Junction 3 of the M3.

- Area 2: The Bracknell Road (B3348) and Crowthorne High Street, Crowthorne AQMA. Declared for exceedances of the annual mean air quality objective for nitrogen dioxide. This AQMA is located 6km north west of Junction 4 of the M3.

5.5.10 There are two AQMAs declared by Slough Borough Council. These are:

- Slough AQMA No.1: An area encompassing land adjacent to the M4 motorway along the north carriageway between junctions 5 and 7, and along the south carriageway between junction 5 and Sutton Lane. Declared for exceedances of the annual mean air quality objective for nitrogen dioxide.
- Slough AQMA No.2: An area encompassing the A4 London Road east of junction 5 of the M4 motorway as far as Sutton Lane. Declared for exceedances of the annual mean air quality objective for nitrogen dioxide.

Monitoring Data

5.5.11 This section summarises key monitoring for the Scheme route.

5.5.12 Within 200m of the Scheme Hart District Council, Rushmoor Borough Council, Surrey Heath Borough Council, Runnymede Borough Council, Spelthorne Borough Council, and the Royal Borough of Windsor and Maidenhead undertake monitoring of nitrogen dioxide (NO₂).

5.5.13 To supplement the NO₂ diffusion tube network managed by the local authority and existing continuous monitors within the vicinity of the Scheme, contractors working on behalf of the Highways Agency initiated an NO₂ monitoring programme in 2010. Tubes were deployed in areas not covered by the local authorities and also at relevant receptors where exceedance of the Annual Mean NO₂ objective was possible.

5.5.14 Monitoring within 200m of the proposed Scheme and affected roads has identified monitoring locations with exceedances of the Annual Mean NO₂ air quality objective of 40 µg/m³. For the initial study area based on original modelled 2015 traffic data (pre mitigation), fifty monitoring sites were within 200m. Following the revised 2015 traffic data which incorporated major committed developments and proposed mitigation, the study area was expanded and an additional eleven sites were within 200m.

5.5.15 Summaries of the NO₂ diffusion tube network results for Local Authorities and the Highways Agency M3 specific monitoring campaign are shown in Table 5.4. Figure 5.2 presents all monitoring data within 200m of the original Scheme route and affected roads that have been used in the assessment. Figure 5.3 presents the additional monitoring data within 200m of the Scheme route and revised affected roads considered as a result of the inclusion of major committed developments.

Table 5.4: Summary of Existing NO₂ Diffusion Tube Data

Diffusion Tube Data	Local Authority	Highways Agency M3 Campaign
Total Number of Locations	30	31
Min ($\mu\text{g}/\text{m}^3$)	26.0	29.5
Max ($\mu\text{g}/\text{m}^3$)	72.6	69.2
Number of Tubes with Data Capture above 75%	27	31
Number of Tubes with Data Capture 90% or above	22	24
Number of Exceeding Tubes	9	17

- 5.5.16 As shown in Table 5.4, diffusion tube monitoring data within the study area shows that the annual mean objective for NO₂ has been exceeded at twenty six locations of the sixty-one considered. This suggests that overall within the study area NO₂ concentrations are around the annual mean objective, with a few hot spot locations.
- 5.5.17 Figures 5.2 and 5.3 show those passive monitoring locations where exceedances of the annual mean NO₂ objective value of 40 $\mu\text{g}/\text{m}^3$ occurred in 2009. Details of the site locations and results for these tubes are contained within Table 5.5.

Table 5.5: Monitoring with Exceedances of an Objective Value

Site ID	Site Location	X	Y	Annual Mean NO ₂ Concentration ($\mu\text{g}/\text{m}^3$)
MO 12	M3 South of Junction 3	492051	162691	49.3
MO 14	M3 North of Junction 3	491965	162780	40.3
MO 16	Badgers Copse, Camberley	488423	159477	40.0
MO 17	Wilders Close, Frimley	487982	159056	41.7
MO 5	Muckhatch Lane, Thorpe	501623	168901	47.7
MO 61	Severn Crescent, Slough	501789	178069	49.9
MO 74	Rosemary Lane, Thorpe	501676	168829	40.6
MO 79	M3 North of Junction 4	486799.8	158319.7	43.5
Eco1 (N)	Chobham Common SSSI	497069	164847	69.2
Eco2 (N15)	Chobham Common SSSI	497060	164860	44.4
Eco3 (N30)	Chobham Common SSSI	497050	164874	40.5
Eco4 (S)	Chobham Common SSSI	497084	164812	44.4
Eco5 (S15)	Chobham Common SSSI	497092	164799	41.7
HB: M25 Boundary	Thorpe Bypass B388 near the M25	501607	168828	51.8
HB: GX AQMS	Oxford Road, Gerard's Cross	501628	187215	46.9
Moor Lane	Moor Lane near Junction 13 of the M25	502607	173275	42.0
P: Belle View	Belle View	501608	187188	45.8

Site ID	Site Location	X	Y	Annual Mean NO ₂ Concentration (µg/m ³)
RY10/Ry11/Ry12	M25 J13 Staines Site B	502808	173572	59.2
RY25	Vicarage Road/Pooley Green Road junction, Egham	501746.1	171347.7	49.9
RY26	Vicarage Road/Pooley Green Road junction, Egham	501717.2	171381.6	72.6
RY6	Egham Sports Centre, Vicarage Road, Egham	501596	171128	42.9
S6	Tatling End, Gerard's Cross	501716	187174	41.2
S18/S19/S20	Triplicate	501626	187211	46.1
SL17	Grampian Way, Slough	501382	178101	42.1
WM15	M25 Wrays Road	502261	172318	48.3
WM15a	M25 Wrays Road	502258	172333	48.1

5.5.18 Continuous monitoring data is available from the UK Air Quality Archive (UKAQA) (Defra, 2013) and local authorities for locations within the vicinity of the Scheme. There are two continuous monitoring units within 200m of the Scheme. Results for 2009 are shown in Table 5.6.

5.5.19 Annual mean background pollutant concentration estimates available from the UKAQA for 2009 and 2015 for the study area considered during this assessment, are shown in Table 5.7. A comparison of background monitoring data with the UKAQA data was considered, however it was found that insufficient background monitoring within the study area was available with which to make any adjustments to the UKAQA background mapping (i.e. no background sites outside of 200m of significant pollutant sources were identified which could be compared with background maps).

5.5.20 Details of all monitoring sites considered as part of the assessment, are provided within Appendix 5.1.

Table 5.6: Local Authority Continuous Monitoring

Site ID	SH Mobile Camberley	Medway Drive, Farnborough
Local Authority	Surrey Heath District Council	Rushmoor Borough Council
Site Type	Urban Background	Roadside
Annual Mean NO ₂ Concentration (µg/m ³)	31.4	36.0
NO _x Data Capture %	58	93.6
Annual Mean NO _x Concentration (µg/m ³)	N/A	N/A
NO _x Data Capture	N/A	N/A

Table 5.7: UKAQA Background Pollution Estimates (Annual Mean)

Pollutant	NO ₂ (µg/m ³)		PM ₁₀ (µg/m ³)	
	Min	Max	Min	Max
2009	15.6	31.2	15.3	20.4
2015	10.7	23.4	14.3	18.9
2019	9.0	21.7	13.8	18.1

5.6 Mitigation and Detailed Scheme Development

5.6.1 Outline mitigation measures for the construction of the Scheme are presented in section 5.7.

5.6.2 Mitigation measures for the operation of the Scheme include the implementation of a 60mph speed limit along a section of the M3 between the following gantry locations:

5.6.3 Eastbound:

- Start Gantry - G47B Ch 20022.
- End Gantry - G37AB Ch 16065.

5.6.4 Westbound:

- Start Gantry - G37AB Ch 16065.
- End Gantry G49AB Ch 20600.

5.6.5 In 2019, it is proposed that this speed restriction be lifted, and the Scheme to run at 70 mph.

5.7 Magnitude of Impacts

Temporary Impacts: Construction

5.7.1 The Scheme is anticipated to be constructed over a period of between 18 and 24 months. Therefore, during this period there is the potential for changes in air quality due to dust emissions along the route, emissions from site plant equipment and vehicles and also from changes in traffic flows along the Scheme with traffic management in place.

5.7.2 The operational assessment has identified that there are sensitive receptors located within 200m of the Scheme route. The areas located up to 200m from the Scheme route which could be affected by construction activities are identified on Figure 5.6 Sheets 1-34. This includes receptors as close as 20-25m from the Scheme, around Junctions 3 and 4 of the M3, South of the M3 between Junctions 3 and 4 at Pans Gardens and Badgers Copse, and; South of the M3 at Lyne Close near to Junction 2 of the M3. These receptors could be affected adversely by increases in dust generation or plant emissions. However, these potential impacts can be controlled by the implementation of suitable mitigation measures in a Construction Environmental Management Plan (CEMP). Examples of likely control measures to minimise dust emissions include:

- Off-site vehicles should be sheeted;
- The wheels and bodies of site vehicles should be cleaned;
- Stockpiles should also be watered; where necessary they should be covered or enclosed to reduce effects of windblown dust;
- Haul routes should be located away from off-site sensitive properties and watered regularly (wet suppression of dust);
- Vehicles transporting earthworks materials to or from site should be sheeted;
- Vehicle speeds over unmade surfaces should be limited;
- The aggregate stocking area is to be located away from sensitive areas and residential properties;
- Drop heights should be minimised to discharge material close to where it is required;
- Bulking of wastes should be consolidated to minimise transportation and handling requirements; and
- A complaint and investigative response procedure should be operated.

5.7.3 Measures to minimise planet emissions should also be utilised during the construction phase. Examples of suitable mitigation measures include the following:

- Where possible, all non-road mobile machinery should use fuel equivalent to ultra-low sulphur diesel;
- Machinery with exhaust emissions should be placed as far from sensitive properties as practicable;
- Vehicles or plant should not be left idling unnecessarily;
- All vehicles and plant should be well maintained and regularly serviced according to manufacturers' recommendations; and
- Where possible haul routes should be located away from off-site sensitive properties.

5.7.4 As noted above changes in air quality could also result from the implementation of traffic management along the Scheme routes. However, it is anticipated that traffic management would maintain three lanes of running traffic with a reduced speed limit. This should limit the potential for re-routing traffic by allowing similar volumes of traffic through the Scheme route. The reduction in speed along the Scheme route may result in some temporary improvement in air quality.

5.7.5 Overall, with mitigation in place, construction related air quality impacts are anticipated to not be significant for the Scheme.

Permanent Impacts: Local Air Quality

5.7.6 Detailed dispersion model predictions have provided estimates of pollutant concentration for the following scenarios:

- 2009 baseline year without Scheme;
- 2015 without Scheme Temporo Growth;
- 2015 with Scheme and no mitigation (70mph on M3) Temporo Growth;
- 2015 without Scheme including major committed developments;
- 2015 with Scheme including major committed developments and mitigation (60mph on section of the M3);
- 2019 with Scheme including major committed developments and mitigation (60mph on section of the M3);

- 2019 with Scheme including major committed developments and no mitigation (70mph on M3).

- 5.7.7 Following the initial quantitative assessment of impacts in 2015 that determined the need for mitigation, the traffic forecasts were updated to exclusively incorporate major committed developments within the forecast data, rather than just using Temprow growth factors, therefore an update to the 2015 without Scheme scenario was also required.
- 5.7.8 Full results for the baseline year, opening year (2015), opening year with mitigation and committed developments (2015), and future year with and without mitigation and with committed developments (2019) are provided for all individual receptors in Appendix 5.1.
- 5.7.9 The results described herein are based on gap analysis calculations. These are conservative predictions based on the assumption that the rates of air quality improvement observed in recent years persist in the operation of the Scheme.

2015 scenario (Temprow growth, no mitigation)

NO₂: Annual Average Concentrations

- 5.7.10 The NO₂ annual average results suggest that there may be some exceedances of the annual mean NO₂ objective value in 2015 along the Scheme routes and near affected roads at 73 of 533 receptors. These exceedances are due to local road traffic, the effects of the Scheme and background contributions of NO₂. All other receptors (452) are predicted to meet the annual average NO₂ air quality objective. Those receptors which are predicted to meet the annual average air quality objective are shown on Figures 5.5 sheets 1-26 in blue.
- 5.7.11 At the majority of these 73 exceeding receptors, NO₂ concentrations are predicted to change by more than +/- 0.4 µg/m³ (65 receptors), due to the scheme of which two are beneficial changes and 63 are detrimental changes. At 5 of the 63 detrimental change locations, concentrations are predicted to change by more than +2 µg/m³ (five receptors), with the remainder (58) being predicted to have a change of between +0.4 and 2 µg/m³. Those receptors which are predicted to exceed the annual average air quality objective with a change of less than 0.4µg/m³ are shown on Figure 5.5 sheets 1-26 in orange shading.
- 5.7.12 In addition to the modelled receptors, there is an apartment building where results indicate that a further 12 receptors are predicted to experience a change of >1% of the EU limit value where concentrations are above the EU limit value of 40 µg/m³.
- 5.7.13 Therefore, air quality at the majority of receptors considered is either below the annual mean air quality objective value or only small changes in annual average NO₂ concentrations are anticipated as a result of the scheme. At five of the 533 receptors considered medium changes are predicted as a result of the scheme.
- 5.7.14 Details of the receptors where NO₂ annual average concentrations are predicted to worsen by more than 0.4 µg/m³ due to the Scheme are presented in Table 5.8.

PM₁₀: Annual Average Concentrations

- 5.7.15 Predicted PM₁₀ concentrations suggest that the annual mean objective value for PM₁₀ will not be exceeded at any location in 2015 with or without the proposed Scheme in operation, with a maximum predicted annual mean concentration of 24.1 µg/m³. Additionally, the maximum change in concentration predicted with the Scheme is 0.9 µg/m³ at all the sensitive receptors modelled.

NO₂ and PM₁₀: Short Term Concentrations

- 5.7.16 The results identify six receptors to have a predicted annual average NO₂ concentration of more than 60 µg/m³ with the Scheme in place. Therefore, it is anticipated that an exceedance of the 1-hour mean objective could occur in these locations. All of these receptors are also predicted to experience concentrations above 60 µg/m³ without the Scheme in place, therefore the one hour mean exceedance is not predicted to change as a result of the Scheme.
- 5.7.17 Additionally, the PM₁₀ 24-hour air quality objective value is not predicted to be exceeded more than the permissible 35 days at any receptor. Small changes in the number of days which exceed the 50 µg/m³ 24-hour air quality objective value are predicted with a maximum increase of two days.

Table 5.8: Selected Annual Mean Nitrogen Dioxide Results- 2015 Scenario (Tempro growth, no mitigation)

Receptor ID	2015 Do-Minimum Concentration (µg/m ³)	2015 Do-Something Concentration (µg/m ³)	Change (µg/m ³)	Figure Number
DR106	42.1	42.8	0.7	Figure 5.5
DR107	39.9	40.6	0.6	Figure 5.5
DR111	44.5	45.4	0.8	Figure 5.5
DR112	43.7	44.5	0.8	Figure 5.5
DR113	42.6	43.3	0.7	Figure 5.5
DR114	41.9	42.5	0.7	Figure 5.5
DR115	40.1	40.7	0.6	Figure 5.5
DR116	39.5	40.1	0.6	Figure 5.5
DR123	43.8	44.7	0.8	Figure 5.5
DR144	42.3	43.0	0.6	Figure 5.5
DR145	40.9	41.5	0.6	Figure 5.5
DR146	43.6	44.3	0.7	Figure 5.5
DR147	44.7	45.4	0.7	Figure 5.5
DR148	45.2	45.9	0.7	Figure 5.5
DR149	44.1	44.8	0.7	Figure 5.5
DR150	44.6	45.3	0.7	Figure 5.5
DR151	43.6	44.2	0.7	Figure 5.5
DR152	44.0	44.7	0.7	Figure 5.5
DR153	42.9	43.6	0.7	Figure 5.5
DR154	42.6	43.2	0.7	Figure 5.5
DR155	41.6	42.3	0.6	Figure 5.5

Receptor ID	2015 Do- Minimum Concentration ($\mu\text{g}/\text{m}^3$)	2015 Do- Something Concentration ($\mu\text{g}/\text{m}^3$)	Change ($\mu\text{g}/\text{m}^3$)	Figure Number
DR156	40.8	41.4	0.6	Figure 5.5
DR167	40.4	42.8	2.4	Figure 5.5
DR168	40.2	42.6	2.4	Figure 5.5
DR169	40.1	42.4	2.3	Figure 5.5
DR175	38.4	40.5	2.1	Figure 5.5
DR304	47.2	47.6	0.4	Figure 5.5
DR305	70.4	71.3	0.8	Figure 5.5
DR306	65.5	66.3	0.8	Figure 5.5
DR311	62.6	63.3	0.7	Figure 5.5
DR47	43.3	44.2	0.9	Figure 5.5
DR48	41.8	42.6	0.8	Figure 5.5
DR49	40.7	41.5	0.8	Figure 5.5
DR50	40.4	41.2	0.8	Figure 5.5
DR51	41.1	41.8	0.7	Figure 5.5
DR52	39.9	40.6	0.7	Figure 5.5
EDR1	45.4	46.8	1.3	Figure 5.5
EDR162	41.3	42.0	0.7	Figure 5.5
EDR177	39.6	40.9	1.2	Figure 5.5
EDR178	40.7	42.0	1.3	Figure 5.5
EDR179	39.1	40.4	1.2	Figure 5.5
EDR185	40.2	41.0	0.7	Figure 5.5
EDR190	63.9	64.8	1.0	Figure 5.5
EDR191	59.1	59.9	0.8	Figure 5.5
EDR192	55.4	56.1	0.7	Figure 5.5
EDR193	53.4	54.1	0.7	Figure 5.5
EDR194	51.3	51.9	0.6	Figure 5.5
EDR198	49.7	50.3	0.6	Figure 5.5
EDR199	48.7	49.3	0.6	Figure 5.5
EDR2	41.5	42.5	1.0	Figure 5.5
EDR200	47.4	47.9	0.6	Figure 5.5
EDR201	46.7	47.3	0.5	Figure 5.5
EDR202	46.2	46.7	0.5	Figure 5.5
EDR207	39.8	40.2	0.5	Figure 5.5
EDR208	65.7	66.7	1.0	Figure 5.5
EDR209	54.6	55.3	0.7	Figure 5.5
EDR3	40.2	41.1	0.9	Figure 5.5
R10	40.1	42.5	2.4	Figure 5.5
R26	42.5	43.4	0.9	Figure 5.5
R36	42.6	44.0	1.4	Figure 5.5
R38	68.3	69.4	1.1	Figure 5.5

Receptor ID	2015 Do-Minimum Concentration ($\mu\text{g}/\text{m}^3$)	2015 Do-Something Concentration ($\mu\text{g}/\text{m}^3$)	Change ($\mu\text{g}/\text{m}^3$)	Figure Number
R6	44.6	45.6	1.0	Figure 5.5
R7	45.8	46.5	0.7	Figure 5.5

2015 Scenario (with major committed developments and mitigation)

5.7.18 Due to the high number of exceedances with a predicted worsening of more than $0.4\mu\text{g}/\text{m}^3$ associated with the original 2015 scenario and the inclusion of major committed developments within the traffic forecasts, an updated scenario with temporary 60 mph speed restrictions along part of the M3 (7am to 7pm) was modelled.

NO_2 : Annual Average Concentrations

5.7.19 The NO_2 annual average results suggest that there may be some exceedances of the annual mean NO_2 objective value in 2015 along the Scheme routes and near affected roads at 67 of 549 receptors. All other receptors (482) are predicted to meet the annual average NO_2 air quality objective. Those receptors which are predicted to meet the annual average air quality objective are shown on Figure 5.6 sheets 1-34 in blue.

5.7.20 At less than half of these 67 exceeding receptors, NO_2 concentrations are predicted to change by more than $\pm 0.4 \mu\text{g}/\text{m}^3$ (28 receptors), of which two are beneficial changes and 26 are detrimental changes. None of the detrimental change locations are predicted to change by more than $+2 \mu\text{g}/\text{m}^3$, with all 26 locations being predicted to have a change of between $+0.4$ and $2 \mu\text{g}/\text{m}^3$. Those receptors which are predicted to exceed the annual average air quality objective with a change of less than $0.4\mu\text{g}/\text{m}^3$ are shown on Figure 5.6 sheets 1-34 in orange shading.

5.7.21 In addition to the modelled receptors, there is an apartment building where results indicate that a further 12 receptors are predicted to experience a change of $>1\%$ of the EU limit value where concentrations are above the EU limit value of $40 \mu\text{g}/\text{m}^3$.

5.7.22 Therefore, air quality at the majority of receptors considered is either below the annual mean air quality objective value or only small changes in annual average NO_2 concentrations are anticipated. Medium changes are predicted at none of the 549 receptors.

5.7.23 Details of the receptors where NO_2 annual average concentrations are predicted to worsen by more than $0.4 \mu\text{g}/\text{m}^3$ due to the Scheme are presented in Table 5.9.

PM_{10} : Annual Average Concentrations

5.7.24 Predicted PM_{10} concentrations suggest that the annual mean objective value for PM_{10} will not be exceeded at any location in 2015 with or without the proposed Scheme in operation, with a maximum predicted annual mean concentration of $24.2 \mu\text{g}/\text{m}^3$. Additionally, the maximum change in concentration predicted with the Scheme is $0.91 \mu\text{g}/\text{m}^3$ at all the sensitive receptors modelled.

NO₂ and PM₁₀: Short Term Concentrations

- 5.7.25 The results identify six receptors to have a predicted annual average NO₂ concentration of more than 60 µg/m³ with the Scheme in place. Therefore, it is anticipated that an exceedance of the 1-hour mean objective could occur in these locations. All of these receptors are also predicted to experience concentrations above 60 µg/m³ without the Scheme in place, therefore the one hour mean exceedance is not predicted to change as a result of the Scheme.
- 5.7.26 Additionally, the PM₁₀ 24-hour air quality objective value is not predicted to be exceeded more than the permissible thirty five days at any receptor. Small changes in the number of days which exceed the 50 µg/m³ 24-hour air quality objective value are predicted with a maximum increase of two days.

Table 5.9 Selected Annual Mean Nitrogen Dioxide Results -2015 Scenario (with major committed developments and mitigation)

Receptor ID	2015 Do-Minimum Concentration (µg/m ³)	2015 Do-Something Concentration (µg/m ³)	Change (µg/m ³)	Figure Number
DR167	39.9	40.9	1.0	Figure 5.6
DR168	39.8	40.8	1.0	Figure 5.6
DR169	39.6	40.6	1.0	Figure 5.6
DR304	39.9	40.9	1.0	Figure 5.6
DR305	39.8	40.8	1.0	Figure 5.6
DR306	39.6	40.6	1.0	Figure 5.6
DR311	47.0	47.4	0.4	Figure 5.6
EDR162	69.6	70.3	0.7	Figure 5.6
EDR177	64.9	65.6	0.7	Figure 5.6
EDR178	62.1	62.7	0.6	Figure 5.6
EDR179	41.3	41.9	0.6	Figure 5.6
EDR185	39.8	40.8	1.0	Figure 5.6
EDR190	40.8	41.9	1.1	Figure 5.6
EDR191	39.2	40.2	1.0	Figure 5.6
EDR192	40.3	40.9	0.6	Figure 5.6
EDR193	63.5	64.3	0.8	Figure 5.6
EDR194	59.0	59.6	0.7	Figure 5.6
EDR198	55.4	55.9	0.6	Figure 5.6
EDR199	53.6	54.1	0.5	Figure 5.6
EDR207	51.3	51.8	0.5	Figure 5.6
EDR208	50.0	50.4	0.4	Figure 5.6
EDR209	49.0	49.4	0.4	Figure 5.6
R10	40.0	40.4	0.4	Figure 5.6
R26	65.3	66.1	0.8	Figure 5.6
R36	54.7	55.2	0.5	Figure 5.6
R38	39.7	40.7	1.0	Figure 5.6

2019 Scenario (with major committed developments, with Scheme, with and without mitigation)

- 5.7.27 A 2019 scenario was modelled to determine the impacts of removing the temporary speed restrictions in place from the opening year with mitigation (2015 scenario with major committed developments and mitigation).

NO₂: Annual Average Concentrations

- 5.7.28 The NO₂ annual average results suggest that there may be some exceedances of the annual mean NO₂ objective value in 2019 along the Scheme routes and near affected roads at 17 of 549 receptors. All other receptors (532) are predicted to meet the annual average NO₂ air quality objective. Those receptors which are predicted to meet the annual average air quality objective are shown on Figure 5.7 sheets 1-34 in blue.
- 5.7.29 At all of these 17 exceeding receptors, NO₂ concentrations are predicted to have no change. Those receptors which are predicted to exceed the annual average air quality objective with a change of less than 0.4µg/m³ are shown on Figure 5.7 sheets 1-34 in orange shading.
- 5.7.30 In addition to the modelled receptors, there is an apartment building where results indicate that a further 12 receptors are predicted to experience a change of >1% of the EU limit value where concentrations are above the EU limit value of 40 µg/m³.
- 5.7.31 Therefore, air quality at the majority of receptors considered is either below the annual mean air quality objective value, or no changes in annual average NO₂ concentrations are anticipated.

PM₁₀: Annual Average Concentrations

- 5.7.32 Predicted PM₁₀ concentrations suggest that the annual mean objective value for PM₁₀ will not be exceeded at any location in 2019 with or without the proposed Scheme in operation, with a maximum predicted annual mean concentration of 22.9 µg/m³. Additionally, the maximum change in concentration predicted with the Scheme is <0.1 µg/m³ at all the sensitive receptors modelled.

NO₂ and PM₁₀: Short Term Concentrations

- 5.7.33 The results identify two receptors to have a predicted annual average NO₂ concentration of more than 60 µg/m³ with the Scheme in place. Therefore, it is anticipated that an exceedance of the 1-hour mean objective could occur in these locations. These two receptors are also predicted to experience concentrations above 60 µg/m³ without the Scheme in place, therefore the one hour mean exceedance is not predicted to change as a result of the Scheme.
- 5.7.34 Additionally, the PM₁₀ 24-hour air quality objective value is not predicted to be exceeded more than the permissible thirty five days at any receptor. Small changes in the number of days which exceed the 50 µg/m³ 24-hour air quality objective value are predicted with a maximum increase of one day.

Permanent Impacts: Designated Ecosystem Sites

5.7.35 The worst case results at the designated ecosystems for NO_x and Nitrogen deposition are presented in Table 5.10 and Table 5.11 respectively, for the 2015 scenario with major committed developments and mitigation.

Table 5.10: Annual Mean NO_x Designated Ecosystem Results

Receptor ID	Description	NO _x (µg/m ³)		
		2015 Do-Minimum Concentration (µg/m ³)	2015 Do-Something Concentration (µg/m ³)	Change in NO _x Concentration (µg/m ³)
E10T	Foxlease and Ancell's MeadowsSSSI – West	59.4	61.2	1.8
E12A	Foxlease and Ancell's Meadows SSSI – East	59.2	60.6	1.4
E5T	Thursley, Ash, Pirbright and Chobham SAC	72.5	77.4	4.9
E13A	Chobham Common SSSI North of M3	116.6	125.5	8.9
E14A	Chobham Common SSSI South of M3	82.9	89.1	6.2
E15A	Staines Moor SSSI	117.5	119.4	1.9

Note: The above results are the worst case receptor location from each modelled transect. Further transect results are presented in Technical Appendix 5.1.

Table 5.11: Annual Mean Nitrogen Deposition Results

Receptor ID	Description	Nitrogen Deposition		
		2015 Do-Minimum Nitrogen Deposition (kg N ha ⁻¹ yr ⁻¹)	2015 Do-Something Nitrogen Deposition (kg N ha ⁻¹ yr ⁻¹)	Change in Nitrogen Deposition (kg N ha ⁻¹ yr ⁻¹)
E10T	Foxlease and Ancell's MeadowsSSSI - West	18.4	18.5	0.1
E12A	Foxlease and Ancell's Meadows SSSI - East	18.4	18.5	0.1
E5T	Thursley, Ash, Pirbright and Chobham SAC	18.4	18.6	0.2
E13A	Chobham Common SSSI North of M3	21.3	21.6	0.3
E14A	Chobham Common SSSI South of M3	18.2	18.4	0.2
E15A	Staines Moor SSSI	21.3	21.4	0.1

Note: The above results are the worst case receptor location from each modelled transect. Further transect results are presented in Technical Appendix 5.1

- 5.7.36 The results indicate that concentrations of NO_x are above the 30 µg/m³ objective for the protection of vegetation at all sites. The highest NO_x concentrations are reported at E13A (Chobham SSSI North of the M3). High concentrations are reported in this location because the site is immediately adjacent to the hard shoulder of the M3 and due to the predominant wind direction.
- 5.7.37 The change in NO_x is also considered to be perceptible, with the highest changes identified at E13A (Chobham SSSI north of the M3) with a maximum change of 8.9 µg/m³. The highest changes in concentration are predicted in this location due to the changes in traffic at this location and due to the close proximity of the site immediately adjacent to the Scheme route. Therefore, in line with IAN 174/12, nitrogen deposition calculations have been prepared and the results of these calculations are presented in Table 5.10.
- 5.7.38 The results indicate a maximum increase in nitrogen deposition at E13A (Chobham SSSI north of the M3) of 0.3 kg N ha⁻¹ y⁻¹. This is due to the change in traffic along the Scheme and the close proximity of the site to the Scheme. The results also indicate that the upper critical load at all designated site are above the lower and upper UNECE critical loads.
- 5.7.39 The overall significance of the changes in NO_x and N-deposition are discussed in detail in Section 8: Nature Conservation, however the assessment concluded that none of the sites considered would experience a significant impact.

Compliance Risk Assessment

- 5.7.40 The results of the local air quality assessment have been used to determine compliance risks with the EU Air Quality Directive, following guidance set out within IAN 175/13.
- 5.7.41 A comparison between the results of the Local Air Quality Assessment and those links reported by Defra to the European Commission as non-compliant has found that, with the proposed mitigation in place, no receptors are located alongside links reported by Defra as non-compliant.
- 5.7.42 This indicates that the Scheme is determined to be at Low Risk of non-compliance with the EU Air Quality Directive.
- 5.7.43 The Scheme will not result in a compliant zone becoming non-compliant, nor will it delay Defra's date for achieving compliance or increase the road length predicted to be in exceedance.

Plan Level WebTAG Results

- 5.7.44 A Plan Level WebTAG appraisal has been completed in respect of PM₁₀ and NO₂ exposure, for the opening year (2015). This assessment has been developed using the WebTAG methodology which considers individual links in isolation. The results of this assessment are provided as required by DMRB guidance, in Table 5.12 and Table 5.13.

5.7.45 The results of the Plan Level WebTAG appraisal for 2015 show that for PM₁₀ there is a net benefit with a negative score. A total of 2,207 properties are predicted to experience an improvement in concentrations, whilst 658 are predicted to experience no change and 3,004 a deterioration. An overall improvement is predicted in 2015 due to the incorporation of speed restrictions (7am to 7pm) along a portion of the Scheme in 2015 until 2019.

Table 5.12: Plan Level Results for PM₁₀ - 2015

The Aggregated Table	0-50m	50-100m	100-150m	150-200m	0-200m
Total properties across all routes (min)	579	1819	1679	1787	5864
Total properties across all routes (some)	584	1818	1687	1780	5869
Do-minimum PM ₁₀ assessment across all routes	11116.1	31999.5	28755.4	30410.5	102281.5
Do-something PM ₁₀ assessment across all routes	11133.9	31926.8	28854.4	30274.9	102190
Net total assessment for PM ₁₀ , all routes (II-I)	-91.5				
Number of properties with an improvement	2207				
Number of properties with no change	658				
Number of properties with a deterioration	3004				

5.7.46 The results of the Plan Level WebTAG appraisal for 2015 show that for NO₂ there is a net improvement overall with a negative score. A total of 4982 properties are predicted to experience an improvement in air quality, whilst 262 properties are predicted to experience no change and 625 properties are predicted to have a deterioration with the Scheme. An overall improvement is predicted in 2015 due to the incorporation of speed restriction (7am to 7pm) along a portion of the Scheme in 2015 until 2019.

Table 5.13: Plan Level Results for NO₂ - 2015

The Aggregated Table	0-50m	50-100m	100-150m	150-200m	0-200m
Total properties across all routes (min)	579	1819	1679	1787	5864
Total properties across all routes (some)	584	1818	1687	1780	5869
Do-minimum NO₂ assessment across all routes	14454.2	31794.0	25875.0	26723.4	98846.6
Do-something NO₂ assessment across all routes	14060.2	31394.7	25806.5	26527.9	97789.3
Net total assessment for PM₁₀, all routes (II-I)	-1057.3				
Number of properties with an improvement	4982				
Number of properties with no change	262				
Number of properties with a deterioration	625				

Permanent Impacts: Regional Air Quality

- 5.7.47 This section outlines the results of the regional air quality assessment for the opening year and design year for CO₂, HC, NO_x and PM₁₀.
- 5.7.48 The results indicate that reduced emissions of HC, NO_x and PM₁₀ are anticipated between the present or baseline situation and the opening year without the Scheme (See Table 5.14). The same pattern is also predicted for the design year (See Table 5.15) with the exception of HC, albeit with larger emission tonnages and larger changes in tonnages. This is because of increases in traffic flows. For NO_x, PM₁₀ and HC, a reduction in emissions is predicted between the present year and future without Scheme, as a result of the anticipated improvements in vehicle emissions over time which offset the increases in flow in this scenario. Between the future without and with Scheme scenarios an increase in all emissions is predicted as a result of the increased traffic flows predicted with the Scheme.

Table 5.14: Opening Year (2015) Regional Assessment

Pollutant	Present (2009) (tonnes)	Without Scheme Opening Year (tonnes)	With Scheme Opening Year (tonnes)	With-scheme compared with	
				Present Without Scheme (tonnes)	Future Without Scheme (tonnes)
HC	59.6	27.8	29.2	-30.4	1.4
NO _x	715.9	391.8	426.9	-289	35.1
PM ₁₀	38.7	26.0	27.6	-11.1	1.6

Table 5.15: Design Year (2030) Regional Assessment

Pollutant	Present (2009) (tonnes)	Without Scheme Opening Year (tonnes)	With Scheme Opening Year (tonnes)	With-Scheme compared with	
				Present Without Scheme (tonnes)	Future Without Scheme (tonnes)
HC	63.0	58.2	64.2	1.1	6.0
NO _x	698.7	148.2	173.4	-525.3	25.2
PM ₁₀	39.2	22.3	24.6	-14.6	2.3

5.7.49 Consideration of carbon emissions has been made following WebTAG 3.3.5 for Greenhouse Gases. This has been used to calculate the change in carbon dioxide emissions over a 60 year appraisal period (between 'with Scheme' and 'without Scheme' scenarios) as 1,185,232 tonnes. This method has also calculated the change in carbon dioxide emissions in opening year, as 23,242 tonnes.

5.8 Significant Effects (including Cumulative)

5.8.1 The temporary air quality effects of the construction of the Scheme are not considered to be significant as these can be controlled via good practice measures as outlined in Section 5.7.

5.8.2 The significance of the Scheme for operational air quality effects is evaluated in Tables 5.16, 5.17 and 5.18.

5.8.3 These tables focus on key locations where air quality may be greater than the air quality objectives for NO₂.

Table 5.16: Evaluation of Operational Local Air Quality Significance – Without Mitigation

Magnitude of Change in NO ₂ (µg/m ³)	Number of Receptors with:	
	Worsening of air quality objective already above objective or creation of a new exceedance	Improvement of an air quality objective already above objective or the removal of an existing exceedance
Large (>4)	0	0
Medium (>2 to 4)	5	0
Small (>0.4 to 2)	57 + 12	0

Table 5.17: Evaluation of Operational Local Air Quality Significance – With Mitigation

Magnitude of Change in NO ₂ (µg/m ³)	Number of Receptors with:	
	Worsening of air quality objective already above objective or creation of a new exceedance	Improvement of an air quality objective already above objective or the removal of an existing exceedance
Large (>4)	0	0
Medium (>2 to 4)	0	0
Small (>0.4 to 2)	26 + 12	0

Table 5.18: Evaluation of Operational Local Air Quality Significance

Key Criteria Questions	Yes / No
Is there a risk that environmental standards will be breached?	Yes
Will there be a large change in environmental conditions?	No
Will the effect continue for a long time?	No
Will many people be affected?	No
Is there a risk that designated sites, areas, or features will be affected?	See Chapter 8- Nature Conservation
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No
On Balance is the Overall Effect Significant?	No
<u>Evidence in Support of the Professional Judgement</u>	
<p>In the opening year (2015) without mitigation there would have been 63 receptors predicted to experience a detrimental change of >1% of the limit value that exceed the annual average air quality objective (58 small changes, 5 medium changes). In addition, there is an apartment building where results indicated that a further 12 receptors are predicted to experience a detrimental change of >1% of the EU limit value where concentrations are above the EU limit value of 40 µg/m³.</p> <p>Due to there being a potentially significant impact without mitigation, it was proposed to operate the M3 ALR on a section of the motorway between Junction 4a and Junction 3 east of Ravenswood Roundabout (4km on the eastbound carriageway and 4.5km on the westbound carriageway) at 60mph until 2019, by which time emissions and air quality are anticipated to have improved sufficiently to operate the scheme without mitigation.</p> <p>In the opening year (2015) of scheme with mitigation there are 26 receptors predicted to experience a detrimental change of >1% of the limit value that exceed the annual average air quality objective (26 small changes). In addition, there is an apartment building where results indicate that a further 12 receptors are predicted to experience a detrimental</p>	

Key Criteria Questions	Yes / No
<p>change of >1% of the EU limit value where concentrations are above the EU limit value of 40 µg/m³. The majority of these 38 receptors are located at a level crossing where queuing occurs whilst the barriers are down. It is proposed that the concentrations of NO₂ in this location are monitored and mitigation considered if a significant change in NO₂ is observed with the scheme.</p> <p>There are no receptors located within 200m of an EU non-compliant link as reported by Defra, which will worsen with the scheme. The scheme will not result in a compliant zone becoming non-compliant, nor will it delay Defra's date for achieving compliance or increase the road length predicted to be in exceedance. The scheme is predicted to be a Low Risk scheme in terms of compliance with the EU Air Quality Directive.</p> <p>In all scenarios assessed the changes in annual mean PM₁₀ are imperceptible or small. Additionally, changes in short term NO₂ are not predicted at any receptor. The 24-hour air quality objective value for PM₁₀ is not predicted to be exceeded more than the permissible thirty five days at any receptor. Small changes in the number of days which exceed the 50 µg/m³ 24-hour air quality objective value are predicted with a maximum increase of 2 days.</p> <p>The effects of the Scheme are not anticipated to last a long time as changes are at worst small with mitigation and predictions indicate that mitigation can be removed by 2019.</p> <p>Few people (i.e. less than 60 locations with a small change at concentrations above the objective value for NO₂) will be affected by the scheme (i.e. with 7am to 7pm mitigation for a portion of the scheme close to Junction 4).</p> <p>The significance of the scheme for designated ecosystem sites is considered further in Section 8: Nature Conservation. This is because small or medium changes in NO_x are anticipated at the modelled designated sites (Chobham Common, Foxlease and Ancell's Meadows east, Foxlease and Ancell's Meadows West, Colony Bog and Bagshot Heath, and; Staines Moor SSSI).</p> <p>Overall, as the majority of the responses to the key questions in the evaluation of operational local air quality are no, and the number of properties with adverse changes in air quality is less than 60, an overall evaluation of 'not significant' has been assigned to the Schemes operational air quality effects.</p>	

5.9 Limitations of Assessment

5.9.1 No significant limitations have been encountered in the preparation of the air quality assessment.

5.10 Summary

5.10.1 This section summarises the results of the 2015 with mitigation (7am to 7pm for a portion of the scheme) and major committed developments scenario.

5.10.2 There are sensitive receptors identified within 200m of the Scheme and affected roads.

5.10.3 There are four AQMAs identified within 200m of the Scheme and affected roads.

- 5.10.4 There are five designated ecosystems within 200m of the Scheme routes or affected roads. Foxlease and Ancell's Meadows SSSI, Colony Bog and Bagshot Heath SSSI, Chobham Common SSSI, Thursley, Ash, Pirbright and Chobham SAC, and Staines Moor SSSI. The overall significance of the changes in NO_x and N-deposition are discussed in detail in Section 8: Nature Conservation, however the assessment concluded that none of the sites considered would experience a significant impact.
- 5.10.5 In the 2015, with Scheme scenario with 60mph mitigation (7am to 7pm for a portion of the scheme) and the inclusion of major committed developments, there are 38 receptor locations with concentrations anticipated to be greater than the air quality objective for NO₂ with a detrimental change in concentration greater than imperceptible. The majority of these 38 receptors are located at a level crossing where queuing occurs whilst the barriers are down. It is proposed that the concentrations of NO₂ in this location are monitored.
- 5.10.6 Air quality will meet 1-hour NO₂ in all but 6 locations with the Scheme. Without the Scheme air quality will also not meet the 1-hour NO₂ objective at these six locations. Annual average PM₁₀ and 24-hour PM₁₀ air quality objectives will be met at all receptors with or without the Scheme. The greatest change in the numbers of days which exceed short term PM₁₀ objective is anticipated to be two days.
- 5.10.7 The Scheme is rated as Low Risk for compliance with the EU Directive, due to no increases in concentration along compliance links. The Scheme will not result in a compliant zone becoming non-compliant, nor will it delay Defra's date for achieving compliance or increase the road length predicted to be in exceedance. This suggests that no AQAP is necessary for the Scheme.
- 5.10.8 In the 2019 with Scheme but without mitigation scenario, the predicted emissions and air quality are anticipated to have improved sufficiently to operate the Scheme without mitigation.
- 5.10.9 Overall local operational air quality effects from the Scheme are considered to be not significant with the proposed mitigation in place until 2019 to avoid adverse impacts around Junction 4.
- 5.10.10 Construction air quality impacts have been discussed and appropriate mitigation measures recommended to avoid adverse temporary effects.
- 5.10.11 Overall construction air quality effects are considered to not be significant for the Scheme.

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6. CULTURAL HERITAGE

6.1 Introduction

6.1.1 This Chapter identifies and addresses the potential environmental effects of the Scheme on Cultural Heritage. The objective of this assessment is to identify the significance of effects on cultural heritage assets likely to arise from the construction and operation of the Scheme. This assessment has been prepared in accordance with the Design Manual for Roads and Bridges (DMRB) Environmental Assessment (DMRB Volume 11.3.2 Cultural Heritage, 2007).

6.1.2 In accordance with advice contained in DMRB Volume 11, a scoping exercise determined that a simple assessment was required with regard to Cultural Heritage.

6.1.3 The objective of a DMRB Simple Assessment (Volume 11, Section 3, Parts 2 and 3) is to:

- Address critical unknown aspects revealed by scoping in order to reach an appropriate understanding of the effects of the Scheme; and
- Clearly establish the value of the affected assets, the impact of the Scheme, and determine satisfactory mitigation measures or enable the need for mitigation to be discounted.

6.2 Regulatory/Policy Framework

6.2.1 The assessment has been undertaken with due regard to national legislation and planning policy, specifically:

- The Planning (Listed Buildings and Conservation Areas Act) 1990;
- The Ancient Monuments and Archaeological Areas Act 1979; and
- Section 12 of the National Planning Policy Framework.

6.2.2 The Regional Strategy for the South East was revoked in March 2013 except for policy NRM6: Thames Basin Heaths Special Protection Area and a policy relating to the former Upper Heyford Air Base in Oxfordshire. As a result, development plans across the former South East government office region now comprise local plans, and where they exist, neighbourhood plans.

6.2.3 The Surrey Heath Local Plan was adopted by Surrey Heath Borough Council in December 2000. Chapter five paragraph 5.16 sets out the Council's Local Plan Strategy as regards heritage as follows:

- (a) To protect the best of the Borough's heritage for the benefit of future generations;
- (b) To protect statutory listed buildings and structures of local significance from inappropriate development and alterations;
- (c) To encourage high standards of design within conservation areas and in respect of historic buildings and features;
- (d) To ensure the preservation and enhancement of the character and appearance of conservation areas;
- (e) To protect Scheduled Ancient Monuments from development;
- (f) To protect areas of archaeological importance and ensure that developers provide adequate arrangements for proper investigation; and

- (g) To protect historic landscapes, parks and gardens from inappropriate development and alterations.
- 6.2.4 Policy HE9 states that any new development affecting the setting of a listed building by virtue of its proximity or its impact on significant views will only be permitted if its design, location and massing is sympathetic to that of the listed building. Paragraph 5.47 underlines the importance of setting for listed buildings and goes on to state that the Council will need to be satisfied that any development outside the curtilage of a listed building does not adversely affect that building's setting.
- 6.2.5 The Rushmoor Core Strategy was adopted by Rushmoor Borough Council in 2011. Chapter eight sets out the Council's strategy with regard to heritage to 2027.
- 6.2.6 Policy CP2 (b) states that development proposals will be permitted providing that they 'Protect and enhance the Borough's heritage assets including its military and aviation history, with particular protection to be given to nationally designated sites.'
- 6.2.7 The Runnymede Borough Local Plan adopted in 2001 sets out the Council's policies for guiding and controlling the way that buildings and land are used and developed.
- 6.2.8 The Local Plan was intended to serve up to the end of 2006 but the majority of the policies have now been 'saved' under the Planning and Compulsory Purchase Act 2004 and continue to form part of the development plan.
- 6.2.9 The chapter Built Environment deals with all aspects of planning and development that impact on built heritage assets.
- 6.2.10 Policy BE 5, Development within Conservation Areas requires that all development (including new buildings, renovations, extensions, hard surfaces, walls and landscaping) preserves or enhances the character or appearance of the particular Conservation Area.
- 6.2.11 Policy BE8, Historic Parks and Gardens states that the Council will not grant permission for development which would have an adverse effect on the character, appearance or setting of a historic park or garden.
- 6.2.12 Policy BE9, Proposals Affecting Listed Buildings requires that proposals should preserve the building, its setting and any features of special architectural or historic interest which it possesses.
- 6.2.13 Policy BE13, Buildings of local architectural or historic interest goes on to say that proposals that detrimentally affect the character or appearance of a locally listed building, or its setting, will not normally be acceptable.
- 6.2.14 Regarding Ancient Monuments and Sites of Archaeological Interest Policy BE14 states that the Council will ensure the preservation, enhancement, proper management and interpretation of scheduled and other nationally important, monuments and their settings and other sites of special archaeological interest and their settings. It goes on to say that any development which would have an adverse effect on these sites or their settings will not be permitted.

6.3 Methodology

- 6.3.1 The assessment methodology follows guidance set out in DMRB, Volume 11, Section 3, Part 2, Cultural Heritage (Highways Agency 2007). Application of appropriate mitigation measures follows guidance set out in DMRB Volume 10, Section 6, (Highways Agency 2001). Assessment of residual effects is undertaken as detailed in Chapter 4. The magnitude of impact is first assessed without reference to the value of the feature, but taking into account any appropriate mitigation. The findings of this assessment are then cross-referenced with the value rating of the feature to establish the significance of residual effect that is likely to result from the Scheme, as detailed in Table 4.2.
- 6.3.2 The value of a structure, area, site or landscape reflects its significance as a historic asset and, therefore, its sensitivity to change. Designations and other criteria currently vary depending on the nature of the asset and therefore the evaluation of archaeological remains, historic buildings and the historic landscape is undertaken by reference to different sets of criteria as outlined in Tables 6.2 to 6.4. The purpose of the evaluation is to allow an objective assessment of the significance of an effect on that heritage asset in accordance with Table 6.1.
- 6.3.3 English Heritage has outlined a number of values which contribute to an asset's value, including evidential, historical, aesthetic and communal value. Non-designated assets may exhibit equivalent values to those which have been granted statutory protection and have been assessed accordingly. The NPPF also provides a series of values, which broadly correspond to those set out by English Heritage, namely archaeological, architectural, artistic or historic.

Table 6.1: Guide for Assessing the Value of Historic Buildings (DMRB 2007)

Criteria for establishing value of historic buildings	
Very High	Standing structures inscribed as being of universal importance, such as World Heritage Sites. Other buildings of recognised international importance.
High	Scheduled Monuments with standing remains. Grade I and Grade II* Listed Buildings. Other listed buildings that can be shown to have exceptional qualities in their fabric or historical association not adequately reflected in their listing grade. Conservation Areas containing very important buildings. Undesignated structures of clear national importance.
Medium	Grade II Listed Buildings. Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical association. Conservation Areas containing important buildings. Historic Townscape or built-up areas with historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).

Criteria for establishing value of historic buildings	
Low	'Locally listed' buildings. Historic (unlisted) buildings of modest quality in their fabric or historical association. Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures).
Negligible	Buildings of no architectural or historical note; buildings of an intrusive character.
Unknown	Buildings with some hidden (i.e. inaccessible) potential for historic significance.

Table 6.2: Guide for Assessing the Value of Historic Landscape Character Units (DMRB 2007)

Importance	Description
Very High	World Heritage Site inscribed for their historic landscape qualities. Historic landscapes of international value, whether designated or not. Extremely well preserved historic landscapes with exceptional coherence, time-depth or other critical factor(s).
High	Designated historic landscapes of outstanding interest. Undesignated landscapes of outstanding interest. Undesignated landscapes of high quality and importance, and of demonstrable national value. Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s).
Medium	Designated special historic landscapes. Undesignated that would justify special historic landscape designation, landscapes of regional value. Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).
Low	Robust undesignated historic landscapes. Historic landscapes with importance to local interest groups. Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.
Negligible	Landscapes with little or no significant historical interest.

Table 6.3: Guide for Assessing the Value of Archaeological Assets (DMRB 2007)

Importance	Description
Very High	World Heritage Sites. Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.
High	Scheduled Monuments. Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.
Medium	Designated or undesignated assets that contribute to regional research objectives.
Low	Undesignated assets of local importance. Assets compromised by poor preservation and/or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.
Negligible	Assets with very little or no surviving archaeological interest.
Unknown	The importance of this resource cannot be ascertained.

6.3.4 Setting is a material consideration in planning and guidance relating to archaeological remains, historic buildings and designed landscapes and should be assessed as part of the EIA process. English Heritage has published specific guidance relating to the setting of heritage assets (English Heritage 2011). The guidance note gives a broad description of how English Heritage view setting. It states that *'setting is the surroundings in which an asset is experienced. All heritage assets have a setting, irrespective of the form in which they survive and whether they are designated or not. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance, or may be neutral'* (pg. 5).

6.3.5 The magnitude of impacts on built heritage assets has been judged in accordance with the factors described in DMRB Volume 11, Section 3, Part 2, Cultural Heritage (Highways Agency 2007). Annex 5 to 7 of DMRB suggests that when assessing magnitude of impact, any proposed mitigation should be taken into account. The tables below include a description of the magnitude of impact applicable both without mitigation and once mitigation has been applied.

Table 6.4: Guidance Factors in the Assessment of Magnitude of Impacts on Built Heritage

Impact	Magnitude
Change to key historic building elements, such that the resource is totally altered. Comprehensive changes to the setting.	Major
Change to many key historic building elements, such that the resource is significantly modified. Changes to the setting of an historic building, such that it is significantly modified.	Moderate
Change to key historic building elements, such that the asset is slightly different. Change to setting of an historic building, such that it is noticeably changed.	Minor
Slight changes to historic building elements or setting that hardly affect it.	Negligible
No change to fabric or setting.	No change

Table 6.5: Guidance Factors in the Assessment of Magnitude of Impacts on Historic Landscape Character Units

Impact	Magnitude
Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.	Major
Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character.	Moderate
Changes to few key historic landscape elements, parcels or components, slight visual changes to few aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access: resulting in limited changes to historic landscape character.	Minor
Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.	Negligible
No change to elements, parcels or components, no visual or audible changes; no changes arising from in amenity or community factors.	No change

Table 6.6: Guidance Factors in the Assessment of Magnitude of Impacts on Archaeology

Impact	Magnitude
Change to most or all key archaeological elements, such that the resource is totally altered. Comprehensive changes to setting.	Major
Changes to many key archaeological elements, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset.	Moderate
Changes to key archaeological elements, such that the asset is slightly altered. Slight changes to setting.	Minor
Very minor changes to elements or setting.	Negligible
No change.	No change

6.4 Study Area

6.4.1 All designated heritage assets within 1km of the Scheme have been identified. Non-designated heritage assets have been identified within a reduced 250m study area, provided by the Hampshire Historic Environment Record (HER) and the Surrey Historic Environment Record. This reflects the relative significance of the assets, as set out in paragraph 128 of the NPPF.

6.4.2 The data has also been checked against the National Heritage List, maintained by English Heritage.

6.4.3 The data has been further cross-referenced to the Zone of Theoretical Visibility (ZTV) referenced within Chapter 7: Landscape and Visual Effects. Due to the nature of the proposals, only those assets within the ZTV, and those assets which border directly with the areas of proposed works which may affect their setting, have been considered as part of this assessment.

6.5 Baseline Conditions

6.5.1 The following section sets out the baseline conditions within the study area. The search of the National Heritage List has identified four Scheduled Monuments, three Registered Parks and Gardens, and 80 listed buildings within the 1km study area, five of them Grade II*. A further 54 non-designated assets have also been identified by the Hampshire and Surrey Historic Environment Records (excluding duplicate assets). There are seven Conservation Areas within the study area. There will be no new land take as part of the Scheme, with any ground works confined to areas of previous disturbance where there is considered to be no archaeological potential; therefore, the following discussion only references those assets with the potential to experience an impact to their setting. This takes into consideration the contribution that setting makes to the significance of the asset and the limited nature of the proposals. A full list of assets is available in Appendix 6.1. Locations of assets are shown in Figures 6.1 to 6.8 in Volume 2 of the EAR.

- 6.5.2 Evidence for prehistoric activity is found outside the ZTV in the form of pottery and worked and burnt flints found in trial and test pitting by the Oxford Archaeological Unit along the line of the proposed M25 at Thorpe Fields. There is a Bronze Age bowl barrow 80m north west of Flutters Hill (A66) and a Bronze Age round barrow (A67), one of an original group of three situated on the crest of a rise some 500m to the south. Bronze Age finds indicative of an occupation site (A58) have been made at Muckhatch Farm to the north west of Junction 2 within the ZTV.
- 6.5.3 The most extensive Iron Age remains within the 1km study area can be found at St. Ann's Hill to the south east of Junction 2. The Scheduled Monument here (A62) comprises a large, univalate hillfort and a later 14th Century chapel, situated on the crest of a hill. The monument has extensive views of the surrounding landscape but is not within the ZTV.
- 6.5.4 Evidence of an Iron Age or Romano British iron working site were found in an excavation of 1985 at South Farm, Lightwater to the south west of Junction 3 (A30) while within the ZTV an Iron Age spear head, was recovered during ploughing on the east facing slope of a field near Ashleigh Farm (A35). Undated field boundaries appear within the ZTV to the east of Kitsmead Lane.
- 6.5.5 Other Roman activity is restricted to two areas. A 1st-2nd Century AD Roman biconical pottery vessel (A55) was found in the River Bourne, north of Bridge Lane, Lyne, when the water was low. Within the ZTV to the south of Windlesham, east of Junction 3 both side ditches of the M3 show evidence of a possible Roman road (A34) aligned north towards Windlesham Church and south towards a gravel ford over the Windle Brook.
- 6.5.6 The landscape character of the area in medieval times was a combination of nucleated settlements and isolated farmsteads. Agriculture played an important part in the development of the area and an appreciable amount of land was in the hands of monastic houses, notably Chertsey Abbey to the east of the region. The abbey owned a number of mills in the area, Windlesham Mill (A31) was still being worked by 1832. There is a reference to a mill on the site of Trumps Mill, about 1km west of Junction 2 in 1299 (A54), the mill eventually closed in 1909 and was converted to private accommodation in 1930. Thorpe Mill (A61) was another ancient mill site, the mill being in use as late as 1784.
- 6.5.7 To the east of Trumps Mill and just over 200 meters from the M3 is the Grade II listed Redlands Farm (A56) with origins in the late 15th Century and with a Grade II listed 18th Century brick barn (A57). Medieval pottery was found at Lightwater Farm (A19) to the south west of Junction 3. Within the ZTV is the site of Hyams Farm, Valley End (A42), marked on the Roque map of 1765 and possibly the site of a medieval farmstead.
- 6.5.8 Thorpe Manor was also a possession of Chertsey Abbey and the village today contains a number of heritage assets dating from the 12th Century on. No 1 Church Approach (A115) is a timber framed medieval hall house with a 17th Century wing in the rear. Within the ZTV the Church of St. Mary in Thorpe (A113) is a Grade II* listed building with a Norman chancel arch, a 13th to 15th Century nave and some 14th Century glass in the north windows. The tower was added in the 16th Century and the aisles were rebuilt in 1848. Also within the ZTV in Thorpe is Manorhouse Farm (A121), an 18th Century brick farmhouse of two storeys and attic with a projecting wing at the rear. The building forms a group with two 17th century Grade II listed barns, the Shire Barn (A122) and

Manorhouse Farm Barn (A123) whose dates indicate the presence of an older house on the site at one time.

- 6.5.9 In Windlesham, west of Bagshot six listed buildings have been identified as being within the ZTV. Nursery Cottage (A73) is a 16th Century house extended in the 18th century and restored in the 20th. The house is 300m from the motorway edge. Further to the north is Birch Hall (A88), a Grade II listed brick built house of c. 1740 with a large 20th Century extension to the rear. Further north still is the Grade II listed church of St. John the Baptist (A86), rebuilt using old materials after a fire on the south side in 1680. The tower was added in 1838 and the chancel, nave and north aisle in 1874. Associated with the church are three tombs, the Birch Tomb (A84), Jenkins Tomb (A87) and Chest Tomb (A85) all Grade II listed and all dating to the late 18th Century.

6.6 Value of Resource

- 6.6.1 The assessment of the value of the resource includes only those heritage assets which are expected to be impacted by the proposals.
- 6.6.2 Three Conservation Areas are within the ZTV. They are Hawley Park and Green, Windlesham and Thorpe. These assets are considered to be of medium value.
- 6.6.3 There is one Grade II* listed building within the ZTV, the Church of St Mary (A113). This asset is considered to be of high value.
- 6.6.4 There are nine Grade II listed buildings within the ZTV. These are the Church of St John the Baptist (A86); three tombs within the churchyard of St John the Baptist (A87, A85, A84); Birch Hall (A88); Nursery Cottage (A73); the Shire Barn at Manorhouse Farm (A122); Manorhouse Farmhouse (A121) and Manorhouse Farm Barn (A123). These buildings are considered to be of medium value.
- 6.6.5 There are four archaeological assets within the ZTV which have potential to experience impacts either from visual impacts or the proposed laydown area at Kitsmead Lane: a possible Roman Road (A34) the evidence for which is found to the north and south of the M3 carriageway to the east of gantry G62A; a findspot (A55) which is located a short distance to the south of gantry G06AB within a small area archaeological potential; the possible former site of a medieval farm (A42) located approximately 150m to the south-west of gantry G19AB within a current farmyard enclosure; and field boundary evidence (A53) around 100m to the south of the carriageway and gantry G12(E)B (eastbound) in an area of archaeological potential which is also directly to the east of the proposed laydown area at Kitsmead Lane. The archaeological resource within the ZTV, or bordering the sites of the proposed gantries, is of importance locally, and is considered to be of low value.
- 6.6.6 No areas of significant historic landscape character, aside from those already considered in the assessment for Conservation Areas and Listed Buildings, are within the ZTV.

6.7 Mitigation and Detailed Scheme Development

- 6.7.1 During the development of the Scheme design, mitigation to avoid or reduce adverse impacts on built heritage assets has been incorporated in the following way:

- Appropriate location of new structures to reduce visual impacts on known heritage assets; and
- Appropriate landscape mitigation to screen key assets and reduce impacts that would affect cultural heritage (refer to Chapter 7 – Landscape and Visual Effects).

6.7.2 These measures have been incorporated into the Scheme assessment. No specific mitigation has been proposed for the cultural heritage resource.

6.8 Magnitude of Impacts

6.8.1 This section describes the significant effects on cultural heritage that would occur as a result of the construction and operation of the Scheme. The information is summarised in a table format (refer to Table 6.8), and records for each identified asset:

- Its value as assessed by review of existing baseline conditions;
- A description of impacts arising from construction of the Scheme;
- Impacts arising from the operation of the Scheme;
- The magnitude of impacts; and
- The significance of effects.

6.8.2 Consideration of visual intrusion and noise impacts are addressed in detail in Chapter 7 – Landscape and Visual Effects and Chapter 10 – Noise and Vibration. Where such impacts have been identified, an analysis of the effect on the value of the asset has been undertaken. Where changes in noise levels or views are not considered to impact on the value of the asset, they have not been identified as a heritage impact.

6.8.3 All works assessed within the chapter take place within the existing carriageway and boundary of the M3 motorway. It is considered that construction of the M3 and its boundaries will have removed any archaeological deposits and that the area of ground disturbance associated with the gantries will be limited.

6.8.4 The magnitude of impact is judged in accordance with the guidance provided in DMRB and set out in Tables 6.4 to 6.6.

6.8.5 This assessment of impacts takes into consideration the current baseline conditions, including the existing M3 and associated infrastructure and also proposed mitigation measures. Only those impacts created by the Scheme are assessed where they are considered to result in an impact on the significance of the asset.

6.8.6 All assets with a theoretical visual relationship to the Scheme have been assessed. The extent of this visibility has been reviewed through field survey, alongside a consideration of the existing context of the asset and its relationship to the M3, and to the eastern end of the route with the junction with the M25. Those assets considered to be affected by the Scheme are identified below.

Construction

- 6.8.7 Hawley Park Conservation Area is located approximately 500m to the north of the site of gantry G48B, on a slight rise but with screening from settlements. It is considered that there would be a negligible impact during construction. Whilst there would be views of construction lighting from some points on the southern edge of the conservation area, this would only affect a small part of the asset.
- 6.8.8 The Church of St John the Baptist (A86) is located on a rise, and would experience a visual impact from proposed gantries G62A and G26AB during operation. The impact during construction and operation is considered to be minor due to the increased levels of lighting and construction traffic within the view from this church, particularly its tower.
- 6.8.9 Construction of gantries churchyard of St John the Baptist (A87, A85, A84). The setting of the tombs is considered to be their relationship with the Church, therefore, whilst construction works may be visible, it is considered that the temporary impact on their significance will be negligible during construction.
- 6.8.10 Gantries G62A and G26AB would also have a visual impact on Birch Hall (A88) during construction due to increased levels of light within views from the proposed gantry location. This will be an increase in the current impact of views to the M3, and is considered to be a minor temporary impact.
- 6.8.11 Nursery Cottage (A73), which is partially screened by other buildings, would be impacted by gantries G62A and G26AB to a limited extent during construction due to glimpsed views of the works. The temporary impact will not detract from the significance of the building or its setting and is considered to be negligible.
- 6.8.12 Windlesham Conservation Area (Windlesham Road/Kennel Lane) is within the ZTV of gantries G62A and G26AB. The southern edges of the Conservation Area would be impacted; however the temporary impact is considered to be negligible during construction given the overall setting of the asset.
- 6.8.13 Gantry G01(E)A is already in existence and is not proposed to be altered. The Thorpe Conservation Area, Church of St Mary (A113), the Shire Barn at Manorhouse Farm (A122), Manorhouse Farmhouse (A121) and Manorhouse Farm Barn (A123) are within the ZTV of this gantry. The latter assets are located within a grouping of farm buildings and as such partially screened, with limited views from some areas of the site to the M25 or M3. As there will be no change or alteration of the gantry, it is considered that there will be no impact or change to the assets during construction.
- 6.8.14 There are four archaeological assets within the Zone of Theoretical Visibility with potential to experience impacts, including a possible Roman Road (A34), a findspot (A55), and the possible former site of a medieval farm (A42), field boundary evidence (A53). Due to their nature, and their distance from the proposed gantries, there is considered to be no change to the setting or significance of these assets during construction.

- 6.8.15 One of these assets, the field boundary evidence (A53) is within an area of archaeological potential which is set directly to the east of the proposed laydown area at Kitsmead Lane. There will be activity at this site in relation to storage for the duration of the project; however, there will be no ground disturbance or change to the setting of the area of archaeological potential, and the impact during construction is considered to be negligible.
- 6.8.16 Two fields, named Upper and Lower Harthouse (A33), border the sites of gantries G62A and G26AB, to the outside of the carriageway boundary. There would be a change to the setting of these assets during construction due to increased lighting and construction traffic, in addition to construction noise, although this is somewhat mitigated by the existing natural and man-made screening of the M3. The impact upon this asset is considered to be negligible as the significance of these assets is not eroded by the impacts.
- 6.8.17 A field, named Kiln Field (A38), is located directly to the south of gantry G22A, outside of the carriageway boundary. There would be a change in the setting of this asset during construction again due to construction lighting, traffic and noise, which would be largely mitigated by existing screening to the M3 in this area. The temporary impact on the asset is considered to be negligible.

Operation

- 6.8.18 The new gantry G48B would be largely screened from the Hawley Park Conservation Area, which has a small amount of fleeting views to the M3. It is considered that there would be a negligible impact during operation on the conservation area.
- 6.8.19 The Church of St John the Baptist (A86) would experience a visual impact from proposed gantries G62A and G26AB during operation. The impact during is considered to be minor due to the increase in impact existing from the current form of the M3.
- 6.8.20 Gantries G62A and G26AB would have a visual impact on three tombs within the churchyard of St John the Baptist (A87, A85, A84). While the gantries may be visible, it is not considered that they will significantly affect the setting of the tombs as they do not affect the relationship of the tombs with the Church. The impact is considered to be negligible.
- 6.8.21 Gantries G62A and G26AB would also have a visual impact on Birch Hall (A88) during construction and operation. This would be an increase in the current impact of views to the M3, and is considered to be minor.
- 6.8.22 Nursery Cottage (A73), which is partially screened by other buildings, would be impacted by gantries G62A and G26AB to a limited extent during operation. The impact, taking into account the existing views to the M3, is considered to be negligible.
- 6.8.23 The southern edges of the Windlesham Conservation Area, which is within the ZTV of gantries G62A and G26AB, would experience a negligible impact during operation, given the existing impact of the M3, and the overall significance of the asset on a whole.

- 6.8.24 As stated in Paragraph 6.8.13, there will be no change or alteration to Gantry G01(E)A. Hence Thorpe Conservation Area, Church of St Mary (A113), Shire Barn at Manorhouse Farm (A122), Manorhouse Farmhouse (A121) and Manorhouse Farm Barn (A123), which are within the ZTV of this gantry, will experience no change in impacts.
- 6.8.25 Due to their nature, and their distance from the proposed gantries, there is considered to be no change to the setting or significance of the four archaeological assets within the ZTV with potential to experience impacts (refer to 6.8.16 above). There will also be no change to the area of archaeological potential related to the Kitsmead Lane laydown during operation.
- 6.8.26 There would be a very small change in the setting of the two fields, named Upper and Lower Harthouse (A33), which border the sites of gantries G62A and G26AB. This would be mitigated by existing natural and man-made screening of the M3. The impact upon these assets is considered to be negligible.
- 6.8.27 There would be a small change in the setting of the field, named Kiln Field (A38), which is located directly to the south of gantry G22A during operation, mitigated by existing screening to the M3 in this area. The impact upon this asset is considered to be negligible.

6.9 Significance of Effects

Construction

- 6.9.1 The significance of effects takes into consideration the value of the asset and the magnitude of impact identified, in accordance with the matrix presented in Table 4.2. The significance of effect also takes into consideration any proposed mitigation.
- 6.9.2 The construction of gantry G48B would have a negligible impact on Hawley Park Conservation Area. This asset is of medium value, and the negligible impact would result in a neutral effect.
- 6.9.3 The construction of gantries G62A and G26AB would have a negligible impact on four Grade II listed assets; Nursery Cottage (A73), and the Chest, Birch and Jenkin's Tombs (A85, A84 and A87). These assets are of medium value, and the negligible impact would result in a neutral effect.
- 6.9.4 The construction of gantries G62A and G26AB would have a slight visual impact on Grade II listed Birch Hall (A88) and the Church of St John (A86). These assets are of medium value, and the minor impact would result in a slight adverse effect, arising from changes to views and in the case of the church in particular the wide setting encompassed by views to and from its tower.
- 6.9.5 The construction of gantries G26AB and G62A would have a negligible impact on Windlesham Conservation Area. This asset is of medium value, and the negligible impact would result in a neutral effect.
- 6.9.6 Gantry G01(E)A already exists and would result in no change in impact on Thorpe Conservation Area, Church of St Mary (A113), Shire Barn at Manorhouse Farm (A122), Manorhouse Farmhouse (A121), and Manorhouse Farm Barn (A123). Therefore the effect will be neutral.

- 6.9.7 There are four archaeological assets within the Zone of Theoretical Visibility with potential to experience impacts. Due to their nature, and their distance from the proposed gantries, there is considered to be no change to the setting or form of these of assets of low value, resulting in a neutral effect.
- 6.9.8 The field boundary markings (A53) and area of archaeological potential bordering the proposed laydown at Kitsmead Lane will experience a negligible impact. These assets are of low value, and construction will have a neutral effect.
- 6.9.9 Gantries G62A and G26AB would have a negligible impact during construction on two fields, named Upper and Lower Harthouse (A33). The asset is of low value, and therefore there would be a neutral effect.
- 6.9.10 Gantry 22A would have a negligible impact on Kiln Field (A38) during construction. This asset is of low value, and therefore there would be a neutral effect.

Operation

- 6.9.11 The operation of gantry G48B would have a negligible impact on Hawley Park Conservation Area due to the change in outward views from the southern boundaries of the conservation area. This asset is of medium value, and the negligible impact would result in a neutral effect.
- 6.9.12 The operation of gantries G62A and G26AB would have a negligible impact on four Grade II listed assets; Nursery Cottage (A73), and the Chest, Birch and Jenkin's Tombs (A85, A84, A87). These assets are of medium value, and the negligible impact would result in a neutral effect.
- 6.9.13 The operation of gantries G62A and G26AB would have a slight visual impact on Grade II listed Birch Hall (A88) and the Church of St John (A86). These assets are of medium value, and the minor impact would result in a slight adverse effect, with the changes in views resulting in additional visual clutter to that existing due to the M3.
- 6.9.14 The operation of gantries G26AB and G62A would have a negligible impact on Windlesham Conservation Area. The asset is of medium value, and the negligible impact would result in a neutral effect.
- 6.9.15 Gantry G01(E)A already exists and there would be no change in impact on to Thorpe Conservation Area, Church of St Mary (A113), Shire Barn at Manorhouse Farm (A122), Manorhouse Farmhouse (A121), and Manorhouse Farm Barn (A123). Therefore the effect will be neutral.
- 6.9.16 There are four archaeological assets within the Zone of Theoretical Visibility with potential impacts. Due to their nature, and their distance from the proposed gantries, there is considered to be no change to the setting or form of these of assets of low value during operation, resulting in a neutral effect. This is also the case for the area of archaeological potential and field markings (A53) bordering the proposed laydown at Kitsmead Lane.
- 6.9.17 Gantries G62A and G26AB would have a negligible impact during operation on two fields, named Upper and Lower Harthouse (A33). This asset is of low value, and therefore there would be a neutral effect.

- 6.9.18 Gantry 22A would have a negligible impact on Kiln Field (A38) during operation. This asset is of low value, and therefore there would be a neutral effect.

6.10 Limitations of Assessment

- 6.10.1 This assessment assumes that there would be no land-take beyond the existing highway corridor and is therefore limited to areas of previous disturbance. Land-take which may occur outside the existing highways boundary includes construction compounds. With the exception of a proposed laydown area at Kitsmead Lane, locations of other potential construction compound areas are not currently known (October 2013). Such areas would, however, be subject to separate assessment and, if not permitted under Permitted Development rights, separate planning permission.

6.11 Summary

- 6.11.1 The Scheme has been assessed in accordance with the requirements of a DMRB Volume 11, Section 3, Part 2, HA 208/07 Simple Assessment.
- 6.11.2 The Scheme will not involve any new permanent land-take and any intrusive works will be within areas of previously disturbed ground. As such, physical impacts to the cultural heritage resource are limited. The assessment of effects has taken into consideration the value of the asset, the current baseline conditions, particularly with regard to the existing M3 corridor, and the scale of the proposals, including any proposed mitigation.
- 6.11.3 There are no substantial impacts identified to Cultural Heritage assets during construction. Where there are adverse impacts to the significance of several assets, these are temporary impacts of construction lighting, traffic and noise; in two cases there are found to be slight adverse effects.
- 6.11.4 During operation, there will be slight adverse effects on two Cultural Heritage assets due to the increase in visual clutter within views additional to the current M3, where these views are designed to be wide (for example church towers or prominent country houses). Otherwise effects are neutral and there is little change to the significance of the assets.
- 6.11.5 Overall, the construction and operation of the gantries would result in a slight adverse effect along the route, with most Cultural Heritage assets experiencing little or no change to their significance. The slight adverse effects would not substantially change the form or significance of the Cultural Heritage in the area at the year of opening, and are a small additional effect of the Scheme on top of the existing effect caused by the current form of the M3. The effects of the Scheme would remain the same for all years following the year of opening.

Table 6.7: Summary of Cultural Heritage Impact Assessment

Asset ID	Asset	Asset Value	Impacts	Magnitude of Impacts	Significance of Effects
Construction Phase					
	Hawley Park Conservation Area	Medium	Visual impact from construction of Gantry G48B	Negligible	Neutral
	Windlesham Conservation Area	Medium	Visual impact from construction of Gantry G62A and G26AB	Negligible	Neutral
A73	Nursery Cottage	Medium	Visual impact from construction of Gantry G62A and G26AB	Negligible	Neutral
A88	Birch Hall	Medium	Visual impact from construction of Gantry G62A and G26AB	Minor	Slight adverse
A86	Church of St John	Medium	Visual impact from construction of Gantry G62A and G26AB	Minor	Slight adverse
A85	Chest Tomb	Medium	Visual impact from construction of Gantry G62A and G26AB	Negligible	Neutral
A84	Birch Tomb	Medium	Visual impact from construction of Gantry G62A and G26AB	Negligible	Neutral
A87	Jenkin's Tomb	Medium	Visual impact from construction of Gantry G62A and G26AB	Negligible	Neutral
A33	Upper and Lower Harthouse	Low	Visual and contextual impact from construction of Gantry G62A and G26AB	Negligible	Neutral
A38	Kiln Field	Low	Visual and contextual impact from construction of Gantry G22A	Negligible	Neutral
A34	Possible Roman Road	Low	Visual impact from construction of Gantry G62A and G26AB	No change	Neutral
A55	Findspot	Low	Visual impact from construction of Gantry G62A and G26AB	No change	Neutral

Asset ID	Asset	Asset Value	Impacts	Magnitude of Impacts	Significance of Effects
A42	Possible former site of medieval farm	Low	Visual impact from construction of Gantry G14AB	No change	Neutral
A53	Field boundary evidence	Low	Kitsmead Lane laydown use	Negligible	Neutral
A113	Church of St. Mary in Thorpe	High	No impact	No change	Neutral
A122	Shire Barn at Manorhouse Farm	Medium	No impact	No change	Neutral
A121	Manorhouse Farmhouse	Medium	No impact	No change	Neutral
A123	Manorhouse Farm Barn	Medium	No impact	No change	Neutral
Operational Phase					
	Hawley Park Conservation Area	Medium	Visual impact from new Gantry G48B	Negligible	Neutral
	Windlesham Conservation Area	Medium	Visual impact from new Gantry G62A and G26AB	Negligible	Neutral
A73	Nursery Cottage	Medium	Visual impact from new Gantry G62A and G26AB	Negligible	Neutral
A88	Birch Hall	Medium	Visual impact from new Gantry G62A and G26AB	Minor	Slight adverse
A86	Church of St John	Medium	Visual impact from new Gantry G62A and G26AB	Minor	Slight adverse
A85	Chest Tomb	Medium	Visual impact from new Gantry G62A and G26AB	Negligible	Neutral
A84	Birch Tomb	Medium	Visual impact from new Gantry G62A and G26AB	Negligible	Neutral
A87	Jenkin's Tomb	Medium	Visual impact from new Gantry G62A and G26AB	Negligible	Neutral
A33	Upper and Lower Harthouse	Low	Visual and contextual impact from new Gantry G62A and G26AB	Negligible	Neutral
A38	Kiln Field	Low	Visual and contextual impact from new Gantry G22A	Negligible	Neutral

Asset ID	Asset	Asset Value	Impacts	Magnitude of Impacts	Significance of Effects
A34	Possible Roman Road	Low	Visual impact from new Gantry G62A and G26AB	No change	Neutral
A55	Findspot	Low	Visual impact from new Gantry G62A and G26AB	No change	Neutral
A42	Possible former site of medieval farm	Low	Cessation of use of Kitsmead Lane laydown	No change	Neutral
A53	Field boundary evidence	Low	Visual impact from new Gantry G12(E)	No change	Neutral
A113	Church of St. Mary in Thorpe	High	No impact	No change	Neutral
A122	Shire Barn at Manorhouse Farm	Medium	No impact	No change	Neutral
A121	Manorhouse Farmhouse	Medium	No impact	No change	Neutral
A123	Manorhouse Farm Barn	Medium	No impact	No change	Neutral

7. LANDSCAPE AND VISUAL EFFECTS

7.1 Introduction

Scope

- 7.1.1 This chapter describes the likely effects of the proposed M3 Junction 2 to Junction 4a Smart Motorway project (the Scheme) upon landscape character and visual amenity of the motorway and the surrounding area. The assessment is based on a thorough understanding of the baseline conditions obtained through desk study and site visits.
- 7.1.2 The assessment makes use of photographs, which are referred to in the text to assist in describing the character of the motorway, the study area and existing views.
- 7.1.3 An iterative assessment and design process has been followed which seeks to reduce, offset or compensate for predicted effects on landscape character and views. Mitigation is proposed to minimise significant adverse effects and to seek to reduce residual impacts where possible.
- 7.1.4 This chapter assesses the effects associated with the installation of both the major and minor infrastructure as part of the proposed Scheme. The assessment is based on the design information in Chapter 2: The Scheme.

Methodology

- 7.1.5 The methodology adopted for this assessment is based upon guidance contained within Interim Advice Note (IAN) 135/10 Landscape and Visual Effects Assessment, applicable to the reporting of environmental impact assessments of trunk road and motorway projects in England. Published in November 2010, the IAN replaced previous guidance in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 5.
- 7.1.6 In addition, the methodology draws upon the following established best practice guidance:
- Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and Institute of Environmental Management and Assessment, 2002);
 - Landscape Character Assessment: Guidance for England and Scotland (Countryside Agency and Scottish Natural Heritage, 2002).
- 7.1.7 A detailed study of the existing landscape components, character and views of the motorway and the study area has been carried out in consideration of the following:
- Motorway context;
 - Topography;
 - Vegetation;
 - Settlement and land-use;
 - Landscape character; and
 - Views from visual receptors.

7.1.8 This is supported by tables, drawings and photographs as appropriate. The planning context with respect to landscape character and visual amenity has also been assessed, taking into account relevant European, national, regional and local planning policies. The baseline study will form the basis of the assessment of the predicted impacts of the Scheme.

Temporal

7.1.9 The potential impacts of the Scheme upon the existing (baseline) landscape character, and receptors' views of that landscape, have been identified and assessed at three points in time:

- During construction;
- During Year 1 of Operation; and
- Following 15 years of operation assuming 15 years growth of trees and shrubs within the highway corridor.

7.1.10 Through the assessment of impacts at these stages, distinctions have been drawn between temporary, permanent and residual impacts. Landscape and visual impacts are further categorised as being either direct (e.g. introduction of built forms), or indirect (e.g. off-site visual impact of construction traffic).

Terminology

7.1.11 **Landscape Character Areas** (LCAs) are areas of relatively homogenous landscape character. They are defined by the combination of elements that contribute to landscape context, character and value. Typical landscape elements include landform, land cover, vegetation and settlement pattern. More subjective criteria are also considered such as scale, unity and enclosure.

7.1.12 **Zone of Theoretical Visibility** (ZTV) provides graphical representation of places within the study area from where the Scheme could potentially be visible. The ZTV is the area within which the Scheme could have an influence or effect on visual amenity. ZTVs are generated by computer by analysing a model of the Scheme and a bare ground Digital Terrain Model (DTM). The effect of vegetation and buildings might subsequently be taken into account.

7.1.13 **Visual Receptors** are special interest or viewer groups who would have views of the Scheme. Visual receptors are identified through interrogation of the ZTV and field work. As the study area for this assessment is large, views for visual receptors are presented as a series of photographs selected to best represent a range of views selected from within the ZTV.

7.1.14 The Environmental Impact Assessment (EIA) process requires that a clear distinction is drawn between landscape and visual impacts:

7.1.15 **Landscape Impacts** relate to the degree of change to physical characteristics or components of the landscape, which together form the character of that landscape, e.g. landform, vegetation and buildings.

7.1.16 **Visual Impacts** relate to the degree of change to an individual receptor's view of that landscape, e.g. local residents, users of public footpaths or motorists passing through the area.

Landscape Assessment Methodology

- 7.1.17 The assessment of landscape impacts has been structured around the identification of LCAs. Within the study area it is possible to identify three categories of areas experiencing different levels of impact: firstly there are areas where development would take place resulting in direct effects; secondly there are areas where there is a degree of intervisibility between the motorway and the surrounding landscape causing indirect effects; and thirdly there are areas where no change would be perceptible.
- 7.1.18 Each LCA has been assigned a sensitivity based on the character and quality of the existing landscape and its ability to accommodate change. As set out in IAN 135/10, the sensitivity of each LCA is classified as High, Moderate or Low as described in Table 7.1.

Table 7.1: Classification of Landscape Sensitivity

Sensitivity	Description
High	<p>Landscapes which by nature of their character would be unable to accommodate change of the type proposed. Typically these would be:</p> <ul style="list-style-type: none"> • Of high quality with distinctive elements and features making a positive contribution to character and sense of place; • Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale; • Areas of special recognised value through use, perception or historic and cultural associations; or • Likely to contain features and elements that are rare and could not be replaced.
Moderate	<p>Landscapes which by nature of their character would be able to partly accommodate change of the type proposed. Typically these would be:</p> <ul style="list-style-type: none"> • Comprised of commonplace elements and features creating generally unremarkable character but with some sense of place; • Locally designated, or their value may be expressed through non-statutory local publications; • Containing some features of value through use, perception or historic and cultural associations; or • Likely to contain some features and elements that could not be replaced.
Low	<p>Landscapes which by nature of their character would be able to accommodate change of the type proposed. Typically these would be:</p> <ul style="list-style-type: none"> • Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place; • Not designated; • Containing few, if any, features of value through use, perception or historic and cultural associations; or • Likely to contain few, if any, features and elements that could not be replaced.

7.1.19 Magnitude of impact is determined through a combination of the scale of the development, the type of development and the level of integration of new features with existing elements. Magnitude of impact is classified as Major, Moderate, Minor, Negligible or No Change, as set out in IAN 135/10 and described in Table 7.2.

Table 7.2: Classification of Impact Magnitude on the Landscape

Magnitude of Impact	Impact Description
Major Adverse	Total loss or large scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements.
Moderate Adverse	Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements.
Minor Adverse	Slight loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
Negligible Adverse	Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements.
No Change	No noticeable loss, damage or alteration to character or features or elements.
Negligible Beneficial	Barely noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Minor Beneficial	Slight improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Moderate Beneficial	Partial or noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features.
Major Beneficial	Large scale improvement of character by the restoration of features and elements, and/or the removal of uncharacteristic and conspicuous features and elements, or by the addition of new distinctive features.

Visual Assessment Methodology

7.1.20 It is widely accepted that visual effects tend to decrease with distance. The Scoping Report (Highways Agency, January 2013) defined a study area of a 1km offset either side of the motorway. This was considered a reflection of the extent to which the Scheme may materially influence the fabric of the landscape and the existing visual amenity. Beyond this distance it was anticipated that the development would be unlikely to give rise to a significant effect.

7.1.21 For the purposes of this assessment, the extent of potential views within this study area has been determined. The screening effect of major blocks of vegetation and buildings has been taken into account assuming a height of 15m for woodland and 8m for buildings. The resulting ZTV for each proposed and upgraded gantry, has been reviewed by desk study and fieldwork against the following criteria in order to determine the selection of visual receptors which form the basis of the visual assessment:

- Receptor function/activity;
- Distance from the Site;
- Topography and elevation;
- Degree and period of exposure; and,
- Distribution of receptors.

7.1.22 Representative photographs have been selected to illustrate the nature of existing views of the M3.

7.1.23 Visual receptors have been assigned a category of sensitivity based on a combination of location, context and expectations of the receptor. Sensitivity of receptors is classified as High, Moderate or Low, as set out in IAN 135/10 and shown in Table 7.3.

Table 7.3: Classification of Visual Receptor Sensitivity

Sensitivity of Visual Receptor	Visual Receptor Description
High	Residential Properties. Users of Public Rights of Way or other recreational trails (e.g. National Trails, footpaths, bridleways, etc.). Users of recreational facilities where the purpose of that recreation is enjoyment of the countryside (e.g. Country Parks, National Trust or other access land, etc.).
Moderate	Outdoor workers. Users of scenic roads, railways or waterways or users of designated tourist routes. Schools and other institutional building, and their outdoor areas.
Low	Indoor workers. Users of main roads (e.g. trunk roads) or passengers in public transport on main arterial routes. Users of recreational facilities where the purpose of that recreation is not related to the view (e.g. sport facilities).

7.1.24 Magnitude of visual impact or degree of change to the composition of the view resulting from the Scheme is determined by the consideration of the following:

- Scale of change;
- Nature of change;
- Duration of change;
- Distance;
- Screening;
- Direction and focus of the view;
- Removal of existing vegetation or other past mitigation;
- Whether the receptor is static or moving; and
- Numbers and types of receptors affected at a viewpoint.

7.1.25 Magnitude of impact is classified as Major, Moderate, Minor, Negligible or No Change, as set out in IAN 135/10 and described in Table 7.4.

Table 7.4: Classification of Impact Magnitude on Visual Receptors

Magnitude of Impact	Impact Description
Major	The project, or part of it would become the dominant feature or focal point of the view.
Moderate	The project, or part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a small part of the project would be discernible, or it is at such a distance that would form a barely noticeable feature or element of the view.
No Change	No part of the project, or work or activity associated with it, is discernible.

Significance of Effects

7.1.26 Whilst there is inevitably a degree of professional judgement involved in determining the levels of significance of landscape and visual effects, they can broadly be determined by the interaction of the sensitivity of receptor and magnitude of impact. This interaction results in categorisation of effects as set out in Chapter 4 and shown in Table 4.2.

7.1.27 A textual description of landscape and visual effects is set out in IAN 135/10 and given in Table 7.5.

Table 7.5: Description of Landscape and Visual Effects

Significance	Description of Landscape Effect	Description of Visual Effect
Very Large Beneficial Effect	The project would: <ul style="list-style-type: none"> Greatly enhance the character (including quality and value) of the landscape; Create an iconic high quality feature and/or series of elements; and Enable a sense of place to be created or greatly enhanced. 	The project would create an iconic new feature that would greatly enhance the view.
Large Beneficial Effect	The project would: <ul style="list-style-type: none"> Enhance the character (including quality and value) of the landscape; Enable the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development; and Enable a sense of place to be enhanced. 	The project would lead to a major improvement in a view from a highly sensitive receptor.

Significance	Description of Landscape Effect	Description of Visual Effect
Moderate Beneficial Effect	<p>The project would:</p> <ul style="list-style-type: none"> • Improve the character (including quality and value) of the landscape; • Enable the restoration of characteristic features and elements partially lost or diminished as a result of changes from inappropriate management or development; and • Enable a sense of place to be restored. 	<p>The proposals would cause obvious improvement to a view from a moderately sensitive receptor, or perceptible improvement to a view from a more sensitive receptor.</p>
Slight Beneficial Effect	<p>The project would:</p> <ul style="list-style-type: none"> • Complement the character (including quality and value) of the landscape; • Maintain or enhance characteristic features and elements; and • Enable some sense of place to be restored. 	<p>The project would cause limited improvement to a view from a receptor of moderate sensitivity, or would cause greater improvement to a view from a receptor of low sensitivity.</p>
Neutral Effect	<p>The project would:</p> <ul style="list-style-type: none"> • Maintain the character (including quality and value) of the landscape; • Blend in with characteristic features and elements; and • Enable a sense of place to be retained. 	<p>No perceptible change to the view.</p>
Slight Adverse Effect	<p>The project would:</p> <ul style="list-style-type: none"> • Not quite fit the character (including quality and value) of the landscape; • Be at variance with characteristic features and elements; and • Detract from a sense of place. 	<p>The project would cause limited deterioration to a view from a receptor of moderate sensitivity, or cause greater deterioration to a view from a receptor of low sensitivity.</p>
Moderate Adverse Effect	<p>The project would:</p> <ul style="list-style-type: none"> • Conflict with the character (including quality and value) of the landscape; • Have an adverse impact on characteristic features or elements; and • Diminish a sense of place. 	<p>The project would cause obvious deterioration to a view from a moderately sensitive receptor, or perceptible damage to a view from a more sensitive receptor.</p>

Significance	Description of Landscape Effect	Description of Visual Effect
Large Adverse Effect	The project would: <ul style="list-style-type: none"> • Be at considerable variance with the character (including quality and value) of the landscape; • Degrade or diminish the integrity of a range of characteristic features and elements; and • Damage a sense of place. 	The project would cause major deterioration to a view from a highly sensitive receptor, and would constitute a major discordant element in the view
Very Large Adverse Effect	The project would: <ul style="list-style-type: none"> • Be at complete variance with the character (including quality and value) of the landscape; • Cause the integrity of characteristic features and elements to be lost; and • Cause a sense of place to be lost. 	The project would cause the loss of views from a highly sensitive receptor, and would constitute a dominant discordant feature in the view.

7.2 Regulatory/Policy Framework

7.2.1 This assessment takes account of relevant legislation and guidance set out in European, national, regional and local planning policy related to landscape character and visual amenity.

European Policy

7.2.2 The European Landscape Convention (ELC) became binding in the UK in 2007 (Natural England, 2007). The Convention aims to promote landscape protection, management and planning at all scales. It includes a number of articles which set out both general and specific measures aimed at recognising the importance of landscapes in law through to the identification and assessment of landscapes (Natural England, 2007). This assessment conforms to the articles of the ELC.

National Policy

7.2.3 National planning policies are set out in the National Planning Policy Framework adopted 27 March 2012. Promoting a strong theme of sustainable development, the Framework aims to strengthen local decision making and reinforce the importance of up-to-date plans. The Framework replaces numerous National Planning Policy Guidance (PPG) and Statements (PPSs) previously issued by central government.

Regional Policy

7.2.4 The Regional Spatial Strategy relevant to the assessment was the South East Plan. The plan was, however, revoked in March 2013. Development plans across the former South East government office region now comprise local plans, and where they exist, neighbourhood plans.

Local Policy

- 7.2.5 The Scheme corridor runs through four local planning authorities; Runnymede in the east, then Surrey Heath and Rushmoor before ending in Hart District in the west.
- Runnymede Borough Local Plan 2001 (Saved Policies 2007)*
- 7.2.6 The Runnymede Borough Local Plan 2001 will eventually be replaced by a Local Development Framework (LDF). A number of policies have been saved in 2007 until the LDF is adopted and form part of the development plan.
- 7.2.7 Policy NE8 Areas of Landscape Importance identifies St. Ann's Hill to the south east of Junction 2. 'special care will be taken in relation to any proposed development to ensure its siting, scale, height, design and materials are in keeping with the surrounding landscape.'
- 7.2.8 Policy NE11 Countryside Management supports 'comprehensive approach to the positive management of the countryside' and seeks the 'implementation of a Landscape Strategy for the Borough.'
- 7.2.9 *Policy NE12 Protection of Trees* provides for the protection of 'significant trees, hedgerows and woodlands and make provision for new planting'. An area of Ancient Woodland is identified on the Proposals Map to the south of the M3.
- 7.2.10 The M3 passes through areas designated as Green Belt and Green Belt policies seek 'to retain attractive landscape, and enhance landscapes, near to where people live' and 'to provide opportunities for access to the open countryside for the urban population.'
- 7.2.11 Policy GB1 Development within the Green Belt states 'there will be a strong presumption against development that would conflict with the purposes of the green belt or adversely affect its open character.'
- 7.2.12 *Policy BE8 Historic Parks and Gardens* seeks to protect identified historic parks and gardens including St. Ann's Hill.
- Surrey Heath Core Strategy and Development Management Policies 2011 – 2028*
- 7.2.13 The Surrey Heath Core Strategy and Development Management Policies were adopted in February 2012 and provide the overarching strategy for planning in Surrey Heath up to 2028.
- 7.2.14 Policy CP13 Green Infrastructure states the Council's commitment to 'plan for a network of accessible and integrated green infrastructure (open spaces) across the Borough.'
- 7.2.15 Policy DM9 Design Principles states development will be acceptable where it 'respects and enhances the local, natural or historic character of the environment be it in an urban or rural setting,' and 'protect trees and other vegetation worthy of retention and provide high quality hard and soft landscaping where appropriate.'

- 7.2.16 Policy DM17 Heritage states that development which affects any Heritage Asset (Registered Parks and Gardens and Conservation Areas) should *'seek to promote the conservation and enhancement of the Asset and its setting.'*
- 7.2.17 The M3 passes through an area identified as Green Belt. As stated in policy DM2, only development limited to appropriate Green Belt uses will be permitted.
Rushmoor Core Strategy 2011
- 7.2.18 Policy CP2 - Design and Heritage provides development guidance on design and protection of Heritage Assets including registered parks and gardens *'Development proposals will be permitted provided that they: include high quality design that respects the character and appearance of the local area, protect and enhance the Borough's heritage assets, with particular protection to be given to nationally designated sites and have regard to the Rushmoor Landscape Assessment.'*
- 7.2.19 Policy CP11 – Green Infrastructure Network seeks to protect and enhance *'a diverse network of accessible, multi-functional green infrastructure across the Borough.'* The infrastructure ranges from parks and gardens and amenity greenspace to green corridors such as the Blackwater Valley and the M3 corridor. The policy permits development that *'does not result in a loss, fragmentation, or significant impact on the function of, the green infrastructure network.'*
- 7.2.20 Land located outside the built up areas in Rushmoor is defined as Countryside and there, the Spatial Strategy (Policy SS1) strictly controls new development. Policy CP14 – Countryside seeks to prevent development which *'adversely affects the character, appearance or landscape of the countryside'*.
Hart District Local Plan (1996 – 2006) Saved Policies 2006
- 7.2.21 Policies within the Hart District Local Plan and first alteration have been retained until the Local Development Framework is adopted.
- 7.2.22 Policy Con 8 Trees, Woodland and Hedgerows: Amenity Value states that planning permission will only be granted if these features are *'capable of being retained in the longer term or if removal is necessary new planting is undertaken to maintain the value of these features.'*
- 7.2.23 Policy Con 12 Historic Parks and Gardens provides protection to registered parks and gardens and states *'Development that would adversely affect historic parks and gardens or their setting will not be permitted.'*
- 7.2.24 Policy Con 7 Riverine Environments recognises the nature conservation, landscape or recreational value of the rivers and seeks to protect the value. This includes the Blackwater River.
- 7.2.25 As the M3 passes into Hart District it is located in an area identified as the Blackwater Strategic Gap. Policy Con19 Strategic Gap and Con 20 Strategic Gaps: Blackwater Valleys states *'Development will not be permitted which would diminish the Strategic Gaps physically or visually.'*
- 7.2.26 The Scheme is supported by the regulatory/policy framework relevant to landscape character and visual amenity.

Designations

- 7.2.27 The search of the National Heritage List has identified 4 Scheduled Monuments, 3 Registered Parks and Gardens, and 80 listed buildings within the 1km study area, 5 of them Grade II*. A further 54 non-designated assets have also been identified by the Hampshire and Surrey Historic Environment Records (excluding duplicate assets). There are 7 Conservation Areas within the study area. A full List of assets is available in Appendix 6.1.
- 7.2.28 It is considered that the Scheme proposals would have no significant impacts on designated sites.
- 7.2.29 For further detail of impact on designated sites, refer to Chapter 6: Cultural Heritage.

7.3 Study Area

- 7.3.1 The study area for this assessment has been set as a 1km offset either side of the length of motorway corridor; beyond this distance it is anticipated that the Scheme would be unlikely to give rise to a significant landscape or visual effect. Within this 1km offset, a ZTV has been established as described in Section 7.1.26 and shown on Figure 7.5.

7.4 Baseline Conditions and Value of Resource

Site Context

- 7.4.1 The Scheme is located along a 21km section of the M3 from Junction 2, M3/M25 intersection in the east to Junction 4a M3/A327, Farnborough intersection in the west. The motorway is a strategic transport link between west London, Southampton, Portsmouth and the Ports of Southampton and Portsmouth, connecting the towns of Camberley, Frimley, Basingstoke and Winchester.

Topography and Drainage

- 7.4.2 The topography of the study area is shown on Figure 7.1 and rises gradually from the M25 and the Thames Valley in the north-east to form a series of low ridges to the west. These gradually rise towards Bagshot and Camberley before falling towards the Blackwater Valley at Junction 4 and Cove Brook beyond. The M3 then crosses a narrow plateau between ridges to the north and south.

Vegetation

- 7.4.3 The vegetation around Junction 2 is dominated by small woodland blocks and mature trees enclosing scattered settlements within a network of major infrastructure junctions. Between are open areas of pasture, parkland and to the east, water filled gravel pits used for recreation.
- 7.4.4 Heathland becomes more prevalent as the motorway heads westwards towards Chobham Common. Tree cover also increases away from the heathland, with villages and detached properties within a dense mature framework of trees. Areas of pasture have been retained within a network of irregular shaped fields interspersed with hedges and mature trees. In some places, pasture and heathland has been lost to golf courses.

- 7.4.5 To the east, the woodland increases, broken up by larger settlements which in places have coalesced to create a continuous urban environment either side of the M3. However the settlements have been developed within a strong framework of trees resulting in tree lined residential areas, broken up by small pockets of public open space. Patches of pasture have been retained around settlement boundaries within irregular shaped fields, enclosed by mature hedges and small woodland blocks. The Blackwater Valley forms an important area of open space within the urban area and is used for recreation, with associated amenity landscape.
- 7.4.6 As the settlement decreases to the west, pasture dominates with woodland along the ridges to the north and south enclosing a broad plateau of irregular shaped fields within a strong hedgerow pattern.

Settlement and Land Use

- 7.4.7 Settlement to the east is broken up by the major road network creating a mosaic of villages and small towns bisected by motorways and other major roads.
- 7.4.8 As the M3 moves west, properties become more scattered with many detached residences in large gardens. The extensive undeveloped Chobham Common is associated with military uses, with areas inaccessible and utilised as training grounds.
- 7.4.9 Beyond Chobham Common, residential development increases within a strong woodland framework. Gradually the small hamlets and villages become more urbanised to the west, coalescing to form a continual ribbon of development through Camberley, Frimley and Farnborough.

Landscape Character- National Character Areas

- 7.4.10 The study area falls within a single National Character Area (NCA) as described by Natural England, Thames Basin Heaths (NCA 129). The key characteristics that are relevant to the study area are detailed below:
- Particularly diverse landscape unified by the high incidence of heathland and coniferous forestry, the open unenclosed nature of which is unusual within the context of the southeast region.
 - Heavily populated and developed area characterised by large towns plus numerous smaller settlements along transport corridors interspersed by open land.
 - Fragmented but often connected blocks of largely neglected remnant heathland as a result of early agricultural clearances and widespread development, with most heath retained on large commons or as Ministry of Defence training areas.
 - The western part of the area is fairly well-wooded with grazed pasture but retains a heathy character due to the dominance of oak/birch/bracken/pine and remnant heath on small unimproved pockets of land.
 - Variety and contrast is given by the wide grazed floodplain, drainage ditches, restored gravel workings and lush wetland vegetation associated with the Kennet Valley.
 - Large tracts of coniferous plantations or mixed wood with beech and birch are typical of much of the area, with significant areas of ancient woodland in the west.

Landscape Character- Sub-regional Character Areas

- 7.4.11 There are two landscape character studies produced by local authorities (Rushmoor and Harts) within the study area. There are no landscape character assessments for Surrey Heath District and Runnymede Borough.

Rushmoor Landscape Character Assessment 2009

- 7.4.12 The character areas identified are:

- *Character Area 2: Frimley Interchange* - Adjacent business park with ornamental landscape, native woodland planting and grassed embankments associated with the roads and the Blackwater River present but inconspicuous.
- *Character Area 22: Urban Residential (B)* - Rows of terraced and semi-detached housing forming open linear streetscapes of a mixture of ages and form in addition to large blocks of uniform housing type. Flat to gently undulating topography; and
- *Character Area 10: Pasture and Woodland* - Remnants of a flat, low lying, meadow pasture. An irregular field pattern of unimproved wetlands and a number of small, scrubby woodland blocks.

Harts Landscape Character Assessment 1997

- 7.4.13 The character area identified is:

- *Character Area 12: Minley* - A diverse patchwork of farmland, open heath, woodland and parkland with a mixed, but pervasively 'heathy', character. A suburbanised and fragmented character created by the intrusion of roads and isolated buildings, and proximity to the urban fringes of Blackwater, Hawley and Fleet.

Landscape Character- Local Areas

- 7.4.14 In the absence of landscape character assessments produced by all the relevant local authorities through the study area at an appropriate scale, the Scoping Report defined five local Landscape Character Areas (LCAs). The location of each LCA is shown on Figure 7.2 and photographs of the M3 travelling through individual LCAs are shown on Figures 7.3 and 7.4.

- 7.4.15 Each LCA is described below and its sensitivity to development has been assessed in the context of the wider area.

LCA A - Urban Fringe

- 7.4.16 LCA A is heavily influenced by the strong linear features of the lit M25 at Junction 2 and the partially lit M3, with rail corridors creating additional detractions and division in the landscape. Topography undulates and generally falls towards the Thames floodplain in the north east with some steeper hills to the north of the M3, where elevated areas afford long distance views to the north, east and south. Vegetation is mature with high density of tree cover to the north of the M3 and more open pastoral landscape of small to medium sized irregular shaped fields, contained by maintained hedges and small tree groups to the south. Development has an overall semi-rural character with a mix of detached properties and large farmsteads and low density residential areas within a

wooded setting. The M3 is generally well screened from the adjacent landscape sitting within cutting with dense roadside mature vegetation and woodland to the north.

- 7.4.17 LCA A is considered to be of ordinary quality and of low value. The M3 is largely within cutting with established roadside vegetation providing screening qualities, suggesting that the LCAs sensitivity to change for development within the motorway corridor is Low.

LCA B - South Chobham Common Heathland

- 7.4.18 LCA B primarily comprises Chobham Common (the Common), an extensive tract of heathland which has developed over the Bagshot Sand deposits. The Common is bisected by the M3 corridor which is unlit and is at grade or in shallow cutting. Landform gently undulates with a locally prominent rounded knoll in the northwest and low ridges south of the M3. Low lying areas are to the northeast and southwest where the topography discreetly falls southwards. Views are largely contained within the Common, though elevated areas afford long distance views to the north, east and south where the M3 can often be glimpsed in direct or filtered views. Tree cover is limited with thin belts of mature trees and pockets of woodland beside paths and on the edge of the Common. The low lying heathland vegetation forms an open, exposed landscape with a sense of isolation. Settlement is along the edges of the Common and is contained within a woodland framework. Apart from the M3, the roads are secondary and well-spaced minimising disturbance of the Common.

- 7.4.19 LCA B is considered to be of good quality and of high value. The M3 is set within shallow cutting or at grade and traffic travelling along is an existing visual intrusion which reduces the LCA's sensitivity to change for development within the motorway corridor to Moderate.

LCA C- Settled Rural/Urban Fringe

- 7.4.20 LCA C forms a transition between the sparsely settled, open heathland setting of Chobham Common to the east and the more intensely developed urban settlements to the west. Landform undulates with many low crests abruptly increasing in definition to the east with the north-south Chobham Ridges and the local landmark, Curley Hill. Wide-ranging views are afforded from elevated locations. Topography overall descends to the southeast towards the Windle Brook and Bourne River corridors.
- 7.4.21 Woodland and heathland are common with fragmented woodland to the north, and pockets of heath occurring in the south, notably at Lightwater Country Park and Westend Common to the southwest. The heathland landscape has been used as a base for military manoeuvres since the eighteenth century.
- 7.4.22 Settlements in the area have a secluded feel, generally set within the woodland or heathland with large residential manors, detached properties and farmsteads hidden from view by the strong framework of mature trees. The road network is concentrated around settlements, with connecting secondary roads through the intervening rural landscapes. The unlit M3 winds through rural farmland of small to medium sized well enclosed fields.

- 7.4.23 LCA C is considered to be of good quality and of medium value. The M3 is generally within cutting, but has sections on embankment to the east; roadside vegetation provides good screening overall, and suggests that the LCA's sensitivity to change to development within the motorway corridor is Low.

LCA D - Urban setting of Camberley/Frimley/Hawley

- 7.4.24 LCA D is defined by extensive clusters of urban settlement. Landform consists of an elevated region of ridges broadly orientated northeast – southwest, forming part of the Chobham Ridges. To the northwest is a plateau of high ground which falls away from the east down to the southwest. The broad Blackwater River valley flows through the centre of the character area.
- 7.4.25 Land use is predominantly residential with settlements that have expanded considerably from original farming and historic route origins. The resulting mix of property types, sizes and architectural styles have formed a diverse residential fabric that intersperses older properties with new within mature tree lined streets. In the southwest post-war terraced and semi-detached housing and more recent development has resulted in a complex local network of minor roads and closes.
- 7.4.26 Mature tree cover is integrated within the urban fabric of the area, with extensive belts along transport corridors, recreational spaces and within properties, particularly to the east, but less frequent to the southwest. Bracknell Forest and Hawley Common form a defining edge to development to the north. To the south, development is less restricted and sprawls further south toward Aldershot along arterial roads and rail corridors.
- 7.4.27 The M3 is largely concealed within cutting, behind environmental barriers and established tree cover as it bisects the urban area.
- 7.4.28 LCA D is considered to be of good quality and of medium value. The M3 is currently well screened within the surrounding townscape, with only some sections elevated and open to view suggesting that this LCA's sensitivity to change to development within the motorway corridor is Low.

LCA E Wooded Urban Fringe

- 7.4.29 LCA E forms a transition between the concentrated urban development of adjacent LCA D, and the rural, undeveloped farmland further to the west. The area is typified by undulating topography, more defined to the north where a series of steep ridges orientated northeast-southwest form a prominent plateau. The landform slopes northeast down to the Blackwater River valley, and also gently toward Basingstoke Canal in the south.
- 7.4.30 Woodland is common with the wooded slopes along the skyline to the north and smaller, scattered blocks of woodland and areas of mature vegetation along field boundaries to the south. Fleet pond is a man-made wetland to the south. Grazing pastoral farmland is the dominant with a pattern of irregular small to medium sized fields well defined by mature mixed hedges, hedgerows and woodland vegetation.
- 7.4.31 Settlement is sparse in the north and west with scattered farmsteads whereas to the south large residential areas have developed around the rail corridor that runs parallel to the motorway.

- 7.4.32 The M3 is unlit and generally on embankment set within a well wooded landscape.
- 7.4.33 LCA E is considered to be of good quality and of medium value. Woodland adjacent to the M3 contains views of the motorway suggesting that this LCA's sensitivity to change to development within the motorway corridor is Low.

Summary of Landscape Character

- 7.4.34 The study area falls within NCA 129, Thames Basin Heaths defined by Natural England. The western end of the study area is located within LCAs defined by Hart District and Rushmoor District. The eastern end of the study area is not included in local authority landscape character assessments.
- 7.4.35 The Scoping Report defined five LCAs across the study area. The landscape character of the study area is varied, comprising a mix of both urban and rural characters. The most sensitive landscape is LCA B, South Chobham Common Heathland.
- 7.4.36 In general, the M3 is visually contained within cutting or dense roadside vegetation. It is however, visible as it crosses Chobham Common where it is at grade. The treatment of the landscape along the M3 reflects the landscape character of the five defined LCAs.
- 7.4.37 Key characteristics of each LCA within the study area are described in Appendix 7.1.

Visual Amenity

- 7.4.38 A ZTV of the proposed and existing gantries to be upgraded has been generated by computer. The ZTV takes into account the effects of large groups of vegetation and buildings on the potential visibility of the Scheme as depicted in Figure 7.5. The effect of individual buildings, environmental barriers, roadside embankments and small groups of trees and shrubs has not been accommodated in the computer model.
- 7.4.39 Individual receptors with possible views of the Scheme have been identified within the proposed ZTV and verified by on-site survey. The receptors have been allocated to receptor groups according to their sensitivity (High, Moderate or Low) to changes in visual amenity. A schedule of visual receptors is available in Appendix 7.2. The locations of these receptors, referred to as Receptors 1 to 110 are shown on Figure 7.6.
- 7.4.40 Photographs of representative views for 26 of the receptors are presented on Figures 7.7 to 7.13 and referred to as Representative View A to Z. The location of each Representative View is shown on Figure 7.6

7.5 Mitigation and Detailed Scheme Development

Summary of the Scheme

- 7.5.1 A full description of the Scheme is provided in Chapter 2: The Scheme. The components of the Scheme relevant to the assessment of landscape and visual effects include:

- Retention and/or modification of 6 existing gantries of two types: Type 1 – Single Span Portal of up to 12m height and Type 3 – MS3 of up to 9.5m;
- Introduction of 55 new gantries of four types: Type 4 – MS4 of up to 9.5m height, Type 5 – ADS Cantilever of up to 11m height, Type 6 - Long Span Cantilever of up to 11.9m height and Type 7 - Superspan Portal of up to 12.1m height;
- Removal of two existing gantries of one type: Type 2 – Single Span Portal of up to 12m height;
- Creation of 12 Emergency Refuge Areas (ERAs), six beside the eastbound carriageway and six beside the westbound carriageway;
- Installation of approximately 121 new motorway signs of 18 types;
- Installation of CCTV;
- Installation of new communications and power cables within ducts offset approximately 2m from the edge of the carriageway along the whole route;
- Installation of cross-cable runs beneath the carriageway with junction pits either end at the edge of the carriageway;
- Installation of cable inspection chambers at cable joint locations along the length of installed cable runs;
- Installation of communication junction boxes to support proposed technology infrastructure;
- Installation of vertical concrete barrier to central reserve and associated pavement works;
- Installation of new surface water drainage to verges and central reserve;
- Installation of new vehicle restraint barriers in verges;
- Resurfacing and strengthening of existing carriageway;
- Local verge widening in some locations, requiring geotechnical solutions for construction of new ERAs and installation of technology infrastructure;
- Retention and, where required, alteration of existing noise barriers for construction of the Scheme;
- Installation of new environmental barriers;
- The Scheme is to be delivered within the existing highway boundary; and
- The Contractor will use the existing hard shoulder for access during construction works within the verges and the outside lane for construction work in the central reserve.

Landscape Mitigation

7.5.2 The aim of the mitigation is to integrate the Scheme into the existing mature landscape of the M3 corridor through the following key measures:

- Careful positioning of components of the Scheme to minimise potential landscape and visual effects;
- Retention where possible of existing vegetation;
- Minimal earthworks to minimise vegetation removal and reduce landscape and visual effects as a result of geotechnical intervention;
- Where vegetation is removed and/or earthworks undertaken, appropriate planting to integrate the new structure into the M3 corridor landscape character; and
- Use of appropriate planting to screen and filter views of the Scheme from visual receptors.

- 7.5.3 The landscape mitigation proposals, including drawings, are presented in Appendix 7.5. Each location for the installation of a component of the Scheme is described and the proposed mitigation described. Information provided for each location is as follows:
- Description of the existing vegetation;
 - Description of the component and its construction;
 - Proposed vegetation removal for construction of the component; and
 - Proposed planting to mitigate the new component within the M3 and the study area.
- 7.5.4 Mitigation planting is categorised by vegetation type and each proposal seeks to replicate the existing vegetation type to ensure that the proposed mitigation planting is congruous with the existing vegetation and the wider landscape setting. The following sets out the broad rationale for reinstatement of vegetation types:
- Verge – typically characterised by open grassland, proposed to be reinstated with grass seed;
 - Scrub – areas are predominantly self-seeded, as such grass seeding is proposed which would allow for natural regeneration of scrub species typically found at each individual location;
 - Evergreen shrubs and trees – evergreen species are located in areas where screening and year round interest is desirable, therefore it is proposed to reinstate these areas using higher proportions of evergreen species to ensure that the existing function and character is maintained;
 - Woodland edge - proposed to be reinstated with woodland edge mix, replicating the existing species proportions, where appropriate;
 - Scattered trees – proposed to be reinstated with woodland mix, replicating the existing species proportions, where appropriate; and
 - Woodland - proposed to be reinstated with woodland mix, replicating the existing species proportions, where appropriate.
- 7.5.5 Ash, elm, beech and sycamore have not been included within proposed planting. Sycamore is an undesirable species for reinstatement due to the prolific self-seeding nature of this species. Beech is intolerant of drought conditions and is showing signs of stress along the Strategic Road Network (SRN) in the South East. Elm and ash have not been replaced in areas where they are present due to disease which could affect the health of these species. There is a limited amount of ash, elm, beech and sycamore along the M3; either designed or colonised therefore the omission of these species from the specified planting mixes is not envisaged to affect the character of the vegetation. The Contractor and the supply chain will adhere to IAN 172/13 Ash dieback – *Chalara fraxinea*.
- 7.5.6 Reinstatement of vegetation for visibility splays associated with ERAs and new signage will consist of, in all cases, grass seeding to prevent future maintenance issues in these locations. Trenches for new communications ducts and cables are located at the edge of the carriageway and where these are not located within the drainage trenches it has been assumed that they will be located within the verge. It is proposed that areas where trenches have been installed will be reinstated with grass seeding.
- 7.5.7 The landscape proposals will form the basis for the detailed landscape design of the Scheme.

7.6 Magnitude of Impacts

7.6.1 The identification of impacts and assessment of effects relies on field surveys undertaken in March 2013 to record existing baseline data and assess the likely impacts of the Scheme on the landscape character and visual receptors within study area.

Construction (May 2014 to January 2016)

7.6.2 Construction of the Scheme would take approximately 19 months to complete. The nature of construction means that impacts on the character of the surrounding landscape and views are inevitable, albeit short-lived and temporary in nature. The construction of the Scheme would involve a number of activities that have the potential to impact on landscape and views. These include the following:

- Traffic management signs and equipment;
- Site clearance operations, including the removal of some existing vegetation within the highway boundary;
- Geotechnical works;
- The establishment and presence of construction compounds, security fencing and temporary working areas throughout the construction period;
- Construction of temporary haul roads and hard-standings and removal at the end of the construction period;
- Excavation and temporary stockpiling of soils and other materials;
- Construction machinery, plant and vehicles accessing and working within the highway corridor;
- Lighting of construction works;
- The passage of heavy construction plant and delivery vehicles on the local road network;
- The erection and operation of temporary cranes, scaffolding, etc.; and
- Service installations including pipe/cablings parallel to and across the carriageway.

Impacts on Landscape Character

7.6.3 The construction of the Scheme would result in a number of direct and indirect effects on the landscape character of the study area as discussed below. Locations of Landscape Character Areas are shown on Figure 7.2.

LCA A - Urban Fringe

7.6.4 Works within LCA A would include:

- Retention and/or modification of 6 existing gantries of two types: Type 1 – Single Span Portal of up to 12m height and Type 3 – MS3 of up to 9.5m;
- Construction of 9 new gantries of two types; Type 4 – MS4 of up to 9.5m height and Type 7 - Superspan Portal of up to 12.1m height;
- Creation of 4 ERAs, two beside the eastbound carriageway and two beside the westbound carriageway;
- Installation of 36 new motorway signs;
- Installation of 9 CCTV, 4 shared gantry base and 5 standalone: and
- Cabling works.

7.6.5 The M3 is generally well screened from the adjacent landscape, sitting within cutting with dense roadside mature vegetation and woodland to the north. Construction works as described in 7.6.2 and above would increase activity within the highway boundary and result in increased traffic on adjacent roads. Though vegetation would be removed to enable construction, the motorway would remain visually contained by its location within cutting.

7.6.6 As a result of the loss of vegetation and increased activity construction would have a direct impact on the character of the highway landscape. In contrast, outside the highway boundary, the containment of the M3 minimises the impact of construction with only indirect impacts on the wider LCA resulting from increased traffic on adjacent roads. The relatively small area of the LCA experiencing impacts compared to the scale of overall LCA would result in a considered Minor adverse impact on the whole LCA A during construction. LCA A has a low sensitivity to change creating a Slight Adverse temporary effect which is considered not significant.

LCA B - South Chobham Common Heathland

7.6.7 Works within LCA B would include:

- Replacement of MS1 with AMI sign;
- Installation of 3 new motorway signs;
- Installation of 2 standalone CCTV;
- Replacement of exiting metal traffic barrier in the central reservation by a concrete barrier; and
- Cabling works.

7.6.8 The M3 is set within shallow cutting or at grade. Gantries and ERAs have been located outside this LCA, though there would be views towards construction of these features in adjacent LCAs from the edge of the LCA. Construction activity in the LCA includes replacement of the metal traffic barrier in the central reservation by a concrete barrier and installation of CCTV, signs and cabling. The increase in activity associated with construction would result in direct impacts to the highway landscape character. The lack of containment of the M3 would result in the limited construction works being visible from other areas outside the highway boundary, disturbing the sense of isolation within the LCA resulting in indirect Minor adverse impacts. The construction impact would be temporary and moving traffic along the M3 already disturbs the LCA, as a result even though LCA B has a moderate sensitivity to change the landscape effect is Slight Adverse which is considered not significant.

LCA C - Settled Rural/Urban Fringe

7.6.9 Works within LCA C would include:

- Construction of 21 new gantries of four types: Type 4 – MS4 of up to 9.5m height, Type 5 – ADS Cantilever of up to 11m height, Type 6 - Long Span Cantilever of up to 11.9m height and Type 7 - Superspan Portal of up to 12.1m height;
- Creation of 4 ERAs, 2 beside the eastbound carriageway and 2 beside the westbound carriageway;
- Installation of 37 new motorway signs;
- Installation of 13 CCTV, 10 shared gantry base, 3 standalone;

- Construction of environmental barriers; and
- Cabling works.

7.6.10 The M3 is generally well screened as it is within cutting and has dense roadside vegetation. Within the highway boundary loss of vegetation and construction works as described in 7.6.2 and above would increase activity and disturb the character of the highway landscape resulting in direct impacts. The screening of the M3 minimises the impact of construction outside the highway boundary with only the increase in construction traffic creating indirect impacts. The relatively small area of the LCA experiencing impacts compared to the scale of overall LCA would result in a considered Minor adverse impact on the whole LCA C during construction. LCA C has a low sensitivity to change creating a Slight Adverse landscape effect which is considered not significant.

LCA D - Urban setting of Camberley/Frimley/Hawley

7.6.11 Works within LCA D would include:

- Construction of 23 new gantries of four types; Type 4 – MS4 of up to 9.5m height, Type 5 – ADS Cantilever of up to 11m height, Type 6 - Long Span Cantilever of up to 11.9m height and Type 7 - Superspan Portal of up to 12.1m height;
- Creation of 4 ERAs, two beside the eastbound carriageway and two beside the westbound carriageway;
- Installation of 39 new motorway signs;
- Installation of 12 shared gantry base CCTV;
- Construction of environmental barriers; and
- Cabling works.

7.6.12 The M3 is largely concealed within cutting, behind environmental barriers and established tree cover as it bisects the urban area. Within the highway boundary, loss of vegetation and construction works as described in 7.6.2 and above would increase activity and disturbance of the highway landscape resulting in a direct major adverse impact. The containment of the motorway limits the impact of construction outside the highway boundary resulting in an indirect impact from increase in construction traffic. The relatively small area of the LCA experiencing impacts compared to the scale of the overall LCA would result in a considered Minor adverse impact on the whole LCA D during construction. LCA D has a low sensitivity to change creating a Slight Adverse landscape effect which is considered not significant.

LCA E Wooded Urban Fringe

7.6.13 Works within LCA E would include:

- Construction of 2 new Type 4 MS4 gantries up to 9.5m height,
- Installation of 7 new motorway signs;
- Installation of 2 shared gantry base CCTV; and
- Cabling works.

- 7.6.14 LCA E extends westwards outside the study area and the Scheme is limited to the edge of the LCA. Construction works as described in 7.6.2 and above are concentrated around Junction 4A, where the motorway is dominated by the raised roads of the junction. The motorway within the junction is in cutting and contained by dense vegetation. Construction works and loss of vegetation would increase activity and cause disruption to the highway landscape resulting in direct impacts. The containment of the M3 by the junction and the limited works being undertaken within the LCA reduces potential for the construction works to create indirect impacts within the wider LCA. As a result, the relatively small area of LCA E around Junction 4a experiencing impacts compared to the scale of the overall LCA would result in a considered Negligible adverse impact on the whole LCA E during construction. LCA E has a low sensitivity to change creating a considered Neutral landscape effect which is not significant.

Summary of Landscape Effects of Construction

- 7.6.15 Construction works would result in a direct adverse impact to the landscape of the highway corridor. The physical containment of the M3 however, reduces potential indirect impacts to the wider area of the Landscape Character Areas. In summary, during construction of the Scheme there would be a Slight Adverse or Neutral landscape effect, which is not considered to be significant (refer to 7.1.31).

Impact on Visual Amenity

- 7.6.16 The likely effects of construction on views from visual receptors during construction are described in Appendix 7.4. The main impacts are discussed below.
- 7.6.17 The views of construction activities not involving tall equipment would be limited in majority of views from receptors by the existing noise barriers, dense roadside vegetation and whether the motorway is in cutting. Where vegetation is removed and the barriers are temporarily interrupted to undertake construction and the motorway is at grade or on embankment, views of the motorway and the construction activities would become visually intrusive. The gradual introduction of the gantry structures and use of tall construction equipment would increase the height of construction activities resulting in greater visibility within views for visual receptors in close proximity and at middle distance.
- 7.6.18 Seven of the 110 visual receptors would experience Moderate visual effects (Receptors 32, 42, 43, 78, 83, 91 and 93) which are considered significant. The receptors are local residents and users of Public Rights of Ways (PRoWs) close to the motorway. All receptors are within 1km of the motorway corridor and their existing views of the M3 are interrupted by vegetation, landform and/or noise barriers. The level of activity of construction and the height of proposed equipment would however add a new element to the views. Though the effects are considered adverse, construction activities are relatively temporary and would be experienced over a short period.

Summary of Visual Effects of Construction

- 7.6.19 During construction over half of the identified visual receptors would experience Negligible or No Change degree of change to their views and therefore no significant visual effect. For the 35 visual receptors, which experience a Minor degree of change to their views, only three receptors would experience temporary significant effects.
- 7.6.20 Of the seven receptors, which would experience a Moderate degree of change to their views, they are in close proximity to the motorway, which is at grade or on embankment and have only a thin strip of vegetation and/or a noise barrier separating them from the motorway. Loss of this vegetation and/or, temporary interruption of a noise barrier would open up views of the motorway and construction activities. The five receptors with high sensitivity would experience temporary significant effects.
- 7.6.21 In summary, the potential effect on visual receptors of construction activities within the motorway boundary diminishes with the density and width of the vegetation screen, the height of noise barriers and whether the motorway is in cutting. Roadside vegetation, noise barriers, vegetation outside the highway boundary and the surrounding buildings and structures screen and filter views of construction. Seven visual receptors, however, would experience Moderate Adverse visual effect, which are considered significant. The construction process is relatively temporary and would be viewed within the context of the existing activity of the motorway corridor.

Year 1 of Operation

- 7.6.22 The following assessment of operational landscape and visual effects considers changes to landscape character and visual amenity on completion of construction of the Scheme (Year 1).

Landscape Effects - Year 1 of Operation

- 7.6.23 The likely effects at Year 1 of operation for each local LCA within the study area is provided in Appendix 7.3.
- 7.6.24 In summary, the new structures associated with the Scheme would be integrated into the existing highway landscape through each Landscape Character Area. The loss of vegetation to install these structures and to create ERAs plus the height of gantries could reduce containment of the M3 and increase visibility of the M3 outside the motorway corridor. These changes would however be dispersed along the highway corridor and, in general, the motorway would continue to be well screened and contained as it runs through the study area.
- 7.6.25 Though the highway landscape would change from loss of vegetation and installation of new structures, the majority of the area covered by the LCAs is outside the highway boundary and unchanged. As a result it is considered that there would be a Negligible adverse landscape impact for LCA A, B, C and D at Year 1 of operation. LCA A, LCA C and LCA D have a low sensitivity to change and the Negligible adverse impact would result in a Neutral effect.

- 7.6.26 For LCA B, South Chobham Common Heathland with moderate sensitivity, the Scheme avoids introducing tall components to this stretch of the M3. Those structures installed are relatively low lying and would blend into the motorway corridor resulting in a Negligible degree of change which is considered a Neutral effect.
- 7.6.27 The two gantries, signs, noise barriers and cabling works introduced around Junction 4a on the eastern edge of LCA E would be integrated into the elevated structures of the junction and though visible locally, they have no impact on the majority of the LCA resulting in an assessment of No Change, and hence a Neutral effect.

Visual Effects – Year 1 of Operation

- 7.6.28 The likely effects on views within the study area at Year 1 of operation are provided in Appendix 7.4.
- 7.6.29 The components of the Scheme would result in no significant visual effects at Year 1 of operation. The varied (over the construction period) and relatively unplanned (in visual terms) impacts of the Scheme during construction would be replaced with an organised layout of gantries, ERAs, signs and other infrastructure associated with the motorway on completion.
- 7.6.30 Noise barriers and/or retained vegetation would help to screen views of the Scheme. Vegetation removal during construction and the height of the gantries would result in the views of the components being available for some receptors. These components would however be seen within the context of the existing structures of the M3 and are considered not significant.

Following 15 Years of Operation in 2030 (Year 15) – Residual Effects

Landscape Effects – Year 15 of Operation

- 7.6.31 After 15 years of operation, the new structures would have become part of the landscape of the motorway corridor. New planting and grass seeding would have grown around the structures, anchoring them into the motorway corridor. In addition mitigation planting would have established to maximise visual containment of the motorway. The Scheme is considered to create no residual effects on landscape character.

Visual Effects – Year 15 of Operation

- 7.6.32 Growth of mitigation planting and retained vegetation would help to minimise visual intrusion of the new structures resulting in no significant residual effects on views of the Scheme after 15 years of operation (2030). The impact on individual receptors is described in Appendix 7.4.

7.7 Significant Effects (including cumulative)

Cumulative Developments

- 7.7.1 Directly adjacent to the Scheme is the former DERA site at Longcross, Chobham Lane. This site has been allocated, in Runnymede Borough Council's Pre-Submission Core Strategy, for mixed use development. A proposal has been submitted to develop the site. The 15 hectare development would incorporate a mix of employment, commercial, retail, residential and public service facilities. If planning permission is obtained, construction is planned to begin in 2014 with completion planned for 2035.
- 7.7.2 The mixed use development would be constructed within a site already partially contained by tree and shrub belts. Retention and enhancement of this vegetation would maintain the enclosure and would enhance the landscape character of LCA B.
- 7.7.3 Of the identified visual receptors, relatively few would have possible views of both the mixed use development and the Scheme (Receptors 23, 24, 25, 26, 27 and 28). Receptors 24 and 25 are enclosed within woodland with no views towards either proposal. Strong screening belts of trees and shrubs protect views from receptors 27 and 28 with only glimpsed views available of construction which is considered a negligible impact. Receptors 23 and 26 would experience views towards both developments and this is considered to have the same level of effect on views of construction of the Scheme alone. This is considered to be a Slight Adverse effect which is not significant.
- 7.7.4 All other cumulative developments considered in Chapter 12 Assessment of Cumulative Effects are outside the study area for the assessment of effects on landscape character and visual amenity.

Construction

- 7.7.5 Seven of the 110 identified visual receptors would experience temporary significant effects. The receptors (32, 42, 43, 78, 83, 91 and 93) are local residents and users of Public Rights of Ways (PRoWs) close to the motorway. Their existing views of the M3 are interrupted by vegetation, landform and/or noise barriers. The level of activity of construction and the height of proposed equipment would however add a new element to the views. Though the effects are considered adverse, construction activities are relatively temporary and would be experienced over a short period.

Year 1 of Operation

- 7.7.6 The components of the Scheme would result in no significant landscape or visual effects at Year 1 of operation.

Following 15 Years of Operation in 2030 (Year 15) – Residual Effects

- 7.7.7 No significant residual landscape or visual effects have been identified following 15 Years of operation.

7.8 Limitations of Assessment

7.8.1 The assessment was undertaken during March 2013 and updated in September 2013 in conjunction with the development of the Scheme design. As detailed design of the Scheme is on-going, a number of assumptions have been made during the assessment to inform the landscape mitigation design.

7.9 Summary

7.9.1 Forty of the identified visual receptors would experience no perceptible change and a Neutral effect. A further 63 would experience a Negligible or Minor degree of change and seven receptors a Moderate degree of change. Of these only seven receptors are considered to experience a significant adverse visual effect.

7.9.2 All these significant adverse visual effects are during construction when the disruption of construction (in visual terms) and the height of equipment would add a new element to the views. Though the effects are considered adverse, construction activities are relatively temporary and would be experienced over a short period.

7.9.3 No significant landscape and visual effects are considered likely at Year 1 of operation and following 15 Years of operation.

7.9.4 As the 7 identified significant visual effects are temporary, the overall effect of the Scheme on the landscape character and visual amenity of the study area is considered not significant.

7.10 References

Design Manual for Roads and Bridges, available at:
<http://www.dft.gov.uk/ha/standard/dmrb>.

Hart District Local Plan (1996 – 2006) Saved Policies 2006, available at
<http://localplan.hart.gov.uk/>.

Interim Advice Note (IAN) 135/10 Landscape and Visual Effects Assessment (November 2010), available at:
<http://www.dft.gov.uk/ha/standards/ians/pdfs/ian135.pdf>.

Interim Advice Note (IAN) 172/13 Ash dieback- *Chalara fraxinea*.

Runnymede Borough Local Plan (Saved Policies 2007). Available at:
http://www.runnymede.gov.uk/portal/site/runnymede/local_plan/.

Rushmoor Core Strategy, 2011, available at:
<http://www.rushmoor.gov.uk/article/2903/Rushmoor-Core-Strategy>.

Surrey Heath Core Strategy and Development Management Policies 2011 – 2028, available at:
<http://www.surreyheath.gov.uk/planningpolicyandconservation/CoreStrategyDPD>.

8. NATURE CONSERVATION

8.1 Introduction

8.1.1 This section presents an assessment of the effects of the Scheme on ecology and nature conservation. The scope of the assessment includes sites designated under national and international legislation (statutory sites), sites protected through local or regional policy (non-statutory sites), and protected or otherwise notable species. The assessment is informed by data collected through desk study and field survey.

8.2 Regulatory/Policy Framework

European and National Legislation

Birds Directive 2009/147/EC (codified version of Directive 79/409/EEC as amended)

8.2.1 The Directive provides for the establishment of a coherent network of Special Protection Areas (SPAs) comprising all the most suitable territories for these species. Since 1994 all SPAs form an integral part of the Natura 2000 ecological network.

8.2.2 The Birds Directive also bans activities that directly threaten birds, such as the deliberate killing or capture of birds, the destruction of their nests and taking of their eggs, and associated activities such as trading in live or dead birds, with a few exceptions.

Habitats Directive

8.2.3 The aim of the Directive is to 'maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest' (Habitats Directive, Article 2(2)). This is achieved through the establishment of a network of Special Areas of Conservation (SACs) which together with Special Protection Areas (paragraph 8.2.1) form the Natura 2000 network of European sites.

8.2.4 The Habitats Directive applies the precautionary principle to European sites (Special Areas of Conservation or Special Protection Areas). Projects can only be permitted having ascertained that there will be no adverse effect on the integrity of the site(s) in question. Projects with predicted adverse impacts on European sites may still be permitted if there are no alternatives to them and there are Imperative Reasons of Overriding Public Interest (IROPI) as to why they should go ahead. In such cases, compensation would be necessary to ensure the overall integrity of the site network.

The Conservation of Habitats and Species Regulations 2010 (as amended)

8.2.5 The Habitats and Species Regulations are the principal means by which the European Union Directive on the Natural Habitats and Wild Fauna and Flora (92/43/EEC) (EC Habitats Directive) is transposed in UK law. They also consolidate all the various amendments made to the Conservation (Natural Habitats, &c.) Regulations 1994 in respect of England and Wales.

8.2.6 The Regulations provide for the designation and protection of 'European sites (paragraph 8.2.4)', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites. In addition, the need for an assessment of impacts on Natura 2000 sites is set out within Article 6 of the EC Habitats Directive 1992, and interpreted into British law by the Conservation of Habitats and Species Regulations 2010.

The Wildlife and Countryside Act 1981 (as amended) (WCA)

8.2.7 The WCA is the major legal instrument for wildlife protection in the UK. This legislation is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention'), the Convention on the Conservation of Migratory Species of Wild Animals (the 'Bonn Convention') and the European Union Directive on the Conservation of Wild Birds (79/409/EEC) (EC Birds Directive) are implemented in Great Britain.

8.2.8 The Act makes it an offence (subject to exceptions) to intentionally kill, injure or take any wild animal listed on Schedule 5 or wild bird listed in Schedule 2, and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places. Schedule 5 includes a number of species and groups of relevance to this assessment including great crested newt, smooth snake, adder and badger. The Act makes it an offence (subject to exceptions) to intentionally pick, uproot or destroy any wild plant listed in Schedule 8.

Natural Environment and Rural Communities (NERC) Act 2006

8.2.9 Section 41 of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The habitats and species of relevance to this assessment are:

8.2.10 Habitats of Principal Importance:

- Hedgerows.
- Ponds.

8.2.11 Species of Principal Importance:

- Great crested newt (*Triturus cristatus*);
- Common toad (*Bufo bufo*);
- Slow worm (*Anguis fragilis*);
- Common lizard (*Zootoca vivipara*);
- Grass snake (*Natrix natrix*);
- Smooth Snake (*Coronella austriaca*);
- Adders (*Vipera berus*);
- Noctule (*Nyctalus noctula*); and
- Soprano Pipistrelle (*Pipistrellus pygmaeus*).

Protection of Badgers Act 1992

8.2.12 The Act makes it an offence, except as permitted by or under this Act, to wilfully kill, injure or take, or attempt to kill, injure or take, a badger.

8.2.13 A person is guilty of an offence if, except as permitted by or under this Act, he/she interferes with a badger sett.

National Policy Framework

National Planning Policy Framework

- 8.2.14 The National Planning Policy Framework (NPPF) replaces all of the Planning Policy Statements and Planning Policy Guidance (PPG) documents, including PPS9. It states that the planning system should aim to conserve and enhance the natural environment by minimising impacts on biodiversity and providing net gains in biodiversity, where possible. Furthermore, local planning authorities should set criteria-based policies against which proposals for any development on or affecting protected wildlife sites will be judged.
- 8.2.15 The presumption in favour of sustainable development (paragraph 14 of the NPPF) does not apply where development requiring appropriate assessment under the Birds or Habitats Directives is being considered, planned or determined.

Regional Policy

South East Biodiversity Strategy (SEBS)

- 8.2.16 The SEBS (<http://strategy.sebiodiversity.org.uk/pages/our-aims.html>) is a web-based resource which aims to provide a framework for the delivery of biodiversity targets that guide and support all those who have an impact on biodiversity in the South East region.
- 8.2.17 The proposed development site falls with SEBS area 37 Thames Basin Heaths with the landscape character area of North Hampshire Lowland and Heath/ Hampshire Downs (in extreme south of area) and the landscape types; Settled Lowland Mosaic Heath Plantation.

Surrey Biodiversity Action Plan

- 8.2.18 The Surrey BAP identifies key habitats for which Habitat Action Plans (HAPs) have been prepared. In addition individual Species Action Plans (SAPs) and grouped SAPs have been prepared.
- 8.2.19 HAP's particularly relevant to the current assessment include:
- Lowland Heathland (including acid grassland and bog); and
 - Road verge.
- 8.2.20 SAP's particularly relevant to current assessment include:
- Small blue butterfly (*Cupido minimus*).
- 8.2.21 The Road Verge Habitat Action Plan (RVHAP) forms part of the Surrey BAP, which is a working group comprising members from various organisations. The RVHAP sets recommendations for:
- Identifying the extent, distribution and biodiversity value of road verges across the County;
 - Principles to be adopted for the survey, management and maintenance of verges;

- Procedures to ensure Surrey County Council, as Highway Authority, meets its legal obligations in respect of species and habitats protected under the Wildlife and Countryside Act (1981) and other legislation;
- Procedures to ensure effective communication between those involved in survey and monitoring and those responsible for the day to day management and maintenance of verges; and
- Opportunities for the involvement of partner organisations and local communities.

Hampshire Biodiversity Action Plan

8.2.22 The Hampshire BAP identifies key habitats for which Habitat Action Plans (HAPs) have been prepared. In addition individual SAPs and grouped SAPs have been prepared.

8.2.23 HAPs particularly relevant to the current assessment include:

- Heathland, acid grassland, bog.

8.2.24 SAPs particularly relevant (that are not covered within HAPs above) include:

- Butterflies and moths;
- Bumblebees; and
- Several bird species (from the 15 for Hampshire), namely linnets and kestrels.

Highways Agency Biodiversity Action Plan (HBAP)

8.2.25 The Highways Agency developed its own Biodiversity Action Plan; HABAP in 2002 as part of the Environmental Strategy Plan. The HABAP is part of the long-term strategy for the conservation of species on the motorway and truck road verges. The objectives seek to manage the soft estate effectively and where possible enhance the biodiversity value of the land.

8.2.26 There are twenty species of importance listed within the HABAP which are associated with broad habitats which can commonly be found within the Highway estate.

8.3 Study Area

8.3.1 The study area includes all ecological receptors which may be affected by the Scheme. The area in which effects could occur is termed the zone of influence. The zone of influence is considered to vary in size depending on the receptor concerned. For the purposes of this assessment the following zones of influence have been considered:

- 30km for sites designated at an international level for bats;
- 1km for all other statutory designated sites and non-statutory sites;
- within and adjacent to the Strategic Road Network (SRN) boundary for all other non-statutory sites;
- 1km for heathland birds;
- 250m for great crested newts; and
- 100m for all other species receptors.

8.3.2 All non-statutory sites within 1km of the Strategic Road Network boundary were initially scoped into the assessment. Further screening of the 45 no. sites was then undertaken to identify those with the potential for direct or indirect effects. Sites screened into the assessment were those:

8.3.3 All non-statutory sites within 1km of the Strategic Road Network boundary were initially scoped into the assessment. Further screening of the 45 no. sites was then undertaken to identify those with the potential for direct or indirect effects. Sites screened into the assessment were those:

- Immediately adjacent to the Strategic Road Network boundary where direct disturbance or 'edge' effects were possible; and
- Within 200m of the boundary where the habitats were considered to be sensitive to any additional nitrogen deposition arising from the Scheme.

8.3.4 Field surveys were undertaken primarily within the Strategic Road Network boundary and immediately adjacent to it, although surveys of ponds for great crested newt were undertaken within 250m of the boundary.

8.4 Methodologies

Desk Study

8.4.1 A desk study was conducted in order to obtain records of internationally designated sites, other designated sites for nature conservation (both statutory and non-statutory) and protected and/or notable species located within 1km radius of the site.

8.4.2 Records were obtained in 2010 from the following sources:

- Multi-agency Geographic Information for the Countryside (MAGIC)⁴ website;
- National Biodiversity Network Gateway (NBN);
- Surrey Biological Records Centre (SBRC);
- Hampshire Biodiversity Information Centre (HBIC);
- Surrey Amphibian and Reptile Group (SARG);
- Ordnance Survey; and
- Environment Agency website – 'What's in your backyard'.

8.4.3 The desk study was updated in January 2013. Records were obtained from the following sources:

- EnterpriseMouchel (Highways Agency), Area 3 Maintenance Area Contractor for Highways Agency (for designated sites and protected species records within and adjacent to the Strategic Road Network (SRN) boundary); and
- 2J's Ecology Consultancy (for the distribution of nightjar (*Caprimulgus europaeus*), woodlark (*Lullula arborea*) and Dartford warbler (*Sylvia undata*) at Chobham Common and Bagshot Heath).

8.4.4 The 2013 desk study is presented in Appendix 8.1.2, and the 2012 desk study in Appendix 8.1.1.

⁴ <http://magic.defra.gov.uk/>

Protected Species Survey Methods

8.4.5 Desk studies and habitat surveys informed the scope of protected species surveys. Surveys undertaken and methods used are outlined in Table 8.1 below.

Table 8.1: Surveys Undertaken and Summary of Methods

Survey type	Date Undertaken	Survey Methods	Reported in Appendix (see Volume 3 – Technical Appendices)
Otter (<i>Lutra lutra</i>)	May 2012	Survey of water courses crossing the M3 within the Scheme looking for field signs of otters (feeding signs, spraint sites, etc.).	Appendix 8.5.1 Otter and Water Vole Report.
Bats (Various species)	Bat activity surveys June-September 2010 and March 2013	Surveys of underpasses using bat detectors to determine the usage of these structures as crossing points for bats. Surveys of bridge structures and mature tree across the Scheme were assessed for their level of potential to support roosting bats.	Appendix 8.3.1 and Appendix 8.4.2 Bat Survey Reports.
Dormouse (<i>Muscardinus avellanarius</i>)	April-October 2010	Placement of nesting tubes in suitable habitat within the Highways Agency's soft estate and periodic checking for animals using them. Phase 1 habitat survey of infrastructure locations undertaken during 2013 included a broad assessment of habitat suitability for dormice.	Appendix 8.4.1 Dormouse Survey Report.
Badger (<i>Meles meles</i>)	April 2012 and February 2013	Search of roadside verges and a further 20m outside the highway boundary for badger setts and their field signs (foot prints, dung/latrines, etc.). Setts are classified based on their usage. 2013 survey comprised a check of setts within or adjacent to proposed working areas.	Badger Survey Reports (Confidential Reports).
Water vole (<i>Arvicola amphibious</i>)	May 2012	Survey of water courses crossing the M3 within the proposed Scheme looking for field signs of water vole (burrows, feeding signs, droppings, etc.).	Appendix 8.5.1 Otter and Water Vole Report.

Survey type	Date Undertaken	Survey Methods	Reported in Appendix (see Volume 3 – Technical Appendices)
Great crested newt (<i>Triturus cristatus</i>)	March-June 2010, April – June 2013	Habitat suitability assessment (HSI) of all ponds and other potentially suitable water bodies within 250m of the Scheme corridor. Survey of all potentially suitable water bodies to identify those which currently support newts. Night-time torching, bottle trapping and egg searching was employed over 4 visits, extended to 6 visits if great crested newts were found. 2013 surveys repeated 2010 scope and method.	Appendix 8.6.1 and Appendix 8.6.2 Great Crested Newt Survey Report.
Rare reptiles (smooth snake <i>Coronella austriaca</i> / sand lizard <i>Lacerta agilis</i>)	April 2012	Population estimates using artificial refugia to catch and count numbers of animals.	Appendix 8.7.1 Rare Reptile Survey Report.
Habitat surveys	March 2013	Phase 1 habitat assessment survey of all gantries, sign and cross cabling, including assessment for potential to support protected species.	Appendix 8.2.1 Phase 1 Habitat Report, Appendix 8.8.1 Gantry Habitat Assessment, Appendix 8.9.1 Sign Habitat Assessment and Appendix 8.10.1 Cabling Habitat Assessment.
Habitat surveys	September 2013	Phase 1 habitat assessment of the gantry laydown and construction compound adjacent to the westbound carriageway at Kitsmead Lane, near Trumps Farm chainage 4200 to 4625 (MP 36/9 to 37/2].	Appendix 8.11.1 Phase 1 Habitat Assessment and Reptile Survey Report.
Reptile surveys	September 2013	Reptile survey of above area at Kitsmead Lane.	Appendix 8.11.1 Phase 1 Habitat Assessment and Reptile Survey Report.

8.4.6 Surveys were not undertaken for common reptiles (with the exception of the Kitsmead Lane laydown and construction compound site), or birds. However, data provided from the desk study (refer to Appendix 8.1.1 and 8.1.2) and the baseline habitats recorded during the Phase 1 habitat survey (Appendix 8.2.1) enables an assessment of their nature conservation value and the Scheme's likely impact on them.

Assessment Methodology

- 8.4.7 The assessment method was in accordance with the framework outlined in DMRB Volume 11, Section 3, Part 4 Ecology and Nature Conservation and based on WebTAG Unit 3.3.10 the biodiversity sub-objective.
- 8.4.8 The overall significance of effect categories detailed within the DMRB combines the appraisal of the Nature Conservation Value with the appraisal of the impact magnitude. Based on the DMRB (Volume 11 Section 2 Table 2.3) and WebTAG (Unit 3.3.10 Table 3) methodologies, very large, and large adverse effects are unlikely to be acceptable on nature conservation grounds. Moderate adverse effects may be important, particularly when considered together with other moderate adverse effects, and will require habitat compensation. Slight adverse effects are unlikely to be important in the decision making process but should be considered in the context of improving the design of the scheme.

8.5 Baseline Conditions and Value of Resource

Statutory designated sites for nature conservation

- 8.5.1 Eleven statutory designated sites for nature conservation occur within 1km of the proposed works site. One site is designated as a Ramsar site, two as Special Protection Areas (SPA), one as a Special Area of Conservation (SAC), five as Sites of Special Scientific Interest (SSSI), one as a National Nature Reserve (NNR) and one site designated as a Local Nature Reserve (LNR). At Chobham Common (ch 6300 to ch 8175) the designations lie within the highway verge and therefore within the site. See Table 8.2 for statutory designations and description.
- 8.5.2 The Mole Gap to Reigate Escarpment SAC is also located within the Scheme's zone of influence as it supports Bechstein's bat (*Myotis bechsteinii*) and is located approximately 18km away. However, the site is not linked by potential impact pathways and thus would not be directly affected by the proposals (as detailed in the Assessment of the Implications on European Sites Report). This site is therefore not considered further in the assessment.

Table 8.2: Statutory Designated Sites within 1km of M3 Junction 2-4a

Site	Distance from Study Site (m)	Designation	Area (ha)	Reason for Designation	Evaluation
Thursley, Ash, Pirbright and Chobham SAC (composite).	Includes highway verge between MP(A)38/9+80 (6300)-40/4+30 (7750) and MP(B)38/9+80 (6300)-40/8+40 (8175).	SAC	The site covers a total area of 5138ha.	The primary reasons for designation are the presence of Annex 1 habitats: Northern Atlantic wet heaths with <i>Erica tetralix</i> , with the site representing this habitat in south-east England. European dry heaths form part of a series of large fragments of once continuous heathland and support important assemblages of animal species, including rare invertebrates, rare reptile species and schedule 1 bird species.	Very high
Thames Basin Heaths (composite): Hawley Common SSSI, Bagshot Heath SSSI, and Chobham Common SSSI.	Includes highway verge between MP(A)38/9+80 (6300)-40/4+30 (7750) and MP(B)38/9+80 (6300)-40/8+40 (8175).and 534m N MP (B) 41/8 (9125) and 302m N MP (B) 54/4 (21710).	SPA	Composite site located across the counties of Surrey, Hampshire and Berkshire.	The Thames Basin Heaths qualifies as an SPA under Article 4.1 of the Directive (79/409/EEC) by supporting populations of nightjar (<i>Caprimulgus europaeus</i>), woodlark (<i>Lullula arborea</i>) and Dartford warbler (<i>Sylvia undata</i>), during the breeding season, which are of European importance.	Very high
South West London Water bodies SPA (composite): Thorpe Park No.1 Gravel Pit SSSI.	100m from Scheme.	SPA	A composite site that covers a total area of 828ha.	This site qualifies for designation under Article 4.2 of the Directive (79/409/EEC) by supporting populations of over-wintering gadwall (<i>Anas strepera</i>) and shoveler (<i>Anas clypeata</i>), which are of European importance.	Very high
South West London Water bodies (composite): Thorpe Park No. 1 Gravel Pit.	100m from Scheme.	RAMSAR	Covering a total area of 828ha.	The SPA qualifying Species include Northern shoveler and Gadwall.	Very high

Site	Distance from Study Site (m)	Designation	Area (ha)	Reason for Designation	Evaluation
Foxlease and Ancell's Meadows	Adjacent to highway verge at MP (B) 56/6+50-55/6+50 (22955) and (A) 55/4+50 (22760)-55/6+20 (22925).	SSSI	The site covers an area of 71ha and is in mixed condition from unfavourable recovering to part destroyed (3.66ha).	Supports a range of habitats including acid grassland, wet heath and mire plant communities on slowly permeable soils. The range of habitats that make up the site form an ecosystem of great diversity, reflected by the fact that 240 plant species have been recorded, including 17 species of sedge, with many of the plants nationally scarce due to drainage and other agricultural improvements.	High
Chobham Common	Includes highway verge between MP(A)38/9+80 (6300)-40/4+30 (7750) and MP(B)38/9+80 (6300)-40/8+40 (8175).and 534m N MP (B) 41/8 (9125).	SSSI	The site covers an area of 651ha and is in mixed condition, from favourable and to unfavourable declining.	One of the largest surviving heathlands in the Thames Basin, the site is supports dry and wet heathland, bog, scrub and woodland. The site supports a rich variety of characteristic heathland plants and animals, including many which are rare or scarce. The heathland bird community is particularly rich, and includes nationally important breeding populations of nightjar, woodlark and Dartford warbler.	High

Site	Distance from Study Site (m)	Designation	Area (ha)	Reason for Designation	Evaluation
Chobham Common	Includes highway verge between MP(A)38/9+80 (6300)-40/4+30 (7750) and MP(B)38/9+80 (6300)-40/8+40 (8175).	NNR	The site covers an area of 513ha.	The area represents one of the finest remaining examples of lowland heath, which is a globally rare and threatened habitat. Chobham Common is also widely recognised as one of the best sites in Britain for spiders, ladybirds, bees and wasps, along with all of the native reptile species and over 110 species of birds. The lowland heath is split into two different types, wet heath and dry heath, both which have different characteristics. The wet heath can be particularly affected by drainage; however this is predominantly located on the western side of the site away from the motorway.	High
Colony Bog and Bagshot Heath	403m S MP (B) 45/8 (13120).	SSSI This site also has SPA status.	The site covers an area of 1127ha and is in mixed condition, from favourable to unfavourable no change.	The site forms one of the finest surviving tracts of predominantly wet heathland in south east England, as well as being the largest in the London Basin. It is made up of modified bog, wet and dry heath and rich unimproved grassland, among others, and supports a rich variety of plants and animals, including county and national rarities, many of which are dependent on high quality heathland or bog for their survival.	High

Site	Distance from Study Site (m)	Designation	Area (ha)	Reason for Designation	Evaluation
Castle Bottom to Yateley and Hawley Commons.	1km N MP (B) 55/7 (23005)	SSSI	The site covers an area of 921ha and is in mixed condition, from favourable to unfavourable declining.	Designated for heathland and young conifer plantation supporting an internationally important population of Dartford warbler and populations of two other internationally important species, woodlark and nightjar. The scrub/heathland interface supports a particularly rich invertebrate fauna including a number of nationally scarce species. It also supports an outstanding dragonfly assemblage.	High
Thorpe Park No.1 Gravel Pit.	100m from Scheme	SSSI	The site covers an area of 42ha and is currently in favourable condition.	Designated for wintering gadwall. The site, a former gravel pit, has now matured to relatively stable ecological state with the banks being almost entirely dominated by trees and shrubs. The site also supports a number of other species of wintering waterfowl, including goldeneye (<i>Bucephala clangula</i>) and smew (<i>Mergus albellus</i>) which occur regularly in small but significant numbers.	High

Note: 'A' refers to westbound carriageway; 'B' refers to eastbound carriageway.

Non-Statutory Sites for Nature Conservation

8.5.3 There are forty-five non-statutory designated sites situated within 1km of the proposed works site. Of these, a total of 19 sites are considered to lie within the zone of influence of the Scheme and are therefore considered further within the assessment. The process for identifying sites within the zone of influence is described in paragraph 8.3.2. A full list of the non-statutory sites within 1km of the Scheme is provided in Technical Appendices 8.1.1 and 8.1.2– Ecological Desk Study.

Table 8.3: Non-Statutory Designated Sites within 1km of M3 Junction 2-4a

Site	Distance from Study Site (m)	Designation	Areas (ha)	Reason for Designation	Evaluation
Knowle Grove	Adjacent to Scheme MP(B) 36/6+40 -37/0 (ch 3970-4325)	SNCI	5.5	Ancient Semi-natural Woodland larger than 5 ha.	Medium
Chobham Common (non-SSSI)	Adjacent to Scheme MP (A) 40/4+40 - 41/1+50 (ch 7755 - 8470)	SNCI	17.4	Secondary woodland and heathland. Important position in ecological unit adjacent to Chobham Common SSSI. Also listed as an 'Important Bird Area' by Birdlife International.	Medium
Lightwater Country Park	Adjacent to Scheme MP(A)45/5+80 -45/9 (ch12900 - 13225)	SNCI	11.38	Heathland, mixed woodland, open water. Heathland is a Priority Habitat in the Surrey and UK BAPs. The site is adjacent to Colony Bog and Bagshot Heath SSSI.	Medium
North East of Black Hill	Adjacent to Scheme MP(B) 46/5+40 -46/8+90 (ch 13859-14200)	SNCI	7.90	Heathland, scrub, neutral-acid grassland.	Medium
Black Hill	Adjacent to Scheme MP(B) 46/8+80 -47/6+20 (ch 14190 - 14925)	SNCI	36.96	Mixed and coniferous woodland, scrub, heath. The site forms part of a large ecological unit made up of semi-natural woodland and heathland that stretches along the Chobham Ridges.	Medium

Site	Distance from Study Site (m)	Designation	Areas (ha)	Reason for Designation	Evaluation
White Hill	Adjacent to Scheme MP (B)46/8+80 -47/6+20 (ch 14190 -14925)	SNCI	80.81	Mosaic of heathland, scrub and woodland. The site is adjacent to the Colony Bog SSSI and forms part of a large ecological unit made up of semi-natural woodland and heathland that stretches along the Chobham Ridges.	Medium
Hawley Meadows	Adjacent to Scheme MP(B) 52/5 - 52/6 (ch 19825 -19925)	SNCI	4.35	Grazed flood plain. An area of relatively unimproved grassland which supports the only native Surrey population of Great Burnet (<i>Sanguisorba officinalis</i>). It is adjacent to a much larger area of similar habitat in Hampshire.	Medium
Meadow north of M3 Junction 4	Adjacent to Scheme MP 52/6 - 52/6+50 (ch 19925 - 19975)	SINC	4.2	Semi-improved grasslands which retain a significant element of unimproved grassland.	Medium
Foxlease Meadow 5	200m	SINC	1.99	Semi-improved grasslands which retain a significant element of unimproved grassland.	Medium
Foxlease Meadow 8	Adjacent to Scheme MP(B) 56/1+40 -56/3 (ch 23450 -23610)	SINC	8	Semi-improved grasslands which retain a significant element of unimproved grassland. Fens, flushes, seepages, springs, inundation grasslands, etc. that support a flora and fauna characteristic of unimproved and waterlogged (seasonal or permanent) conditions.	Medium
Foxlease Meadow Field 10	185m	SINC	1.51	Semi-improved grasslands which retain a significant element of unimproved grassland.	Medium
Foxlease Meadows Field 11	Adjacent to Scheme MP(A)56/1+40 -56/3+80 (ch 23450 -23690)	SINC	3.67	Supports the notable species Bladder-sedge (<i>Carex vesicaria</i>).	Medium
Trumps Mill	20m	SNCI	8.0	Comprises dry broad-leaved and alder (<i>Alnus glutinosa</i>) woodland.	Medium

Site	Distance from Study Site (m)	Designation	Areas (ha)	Reason for Designation	Evaluation
Tekels Park	50m	SNCI	4.44	Unimproved acid grassland and small patches of heath. Lowland Heathland, (including acid grassland) is a Priority Habitat in both the Surrey and UK Biodiversity Action Plans.	Medium
Hawley Common	50m	SINC	57.16	Areas of heathland vegetation; including matrices of dwarf shrub, acid grassland, valley mires and scrub. Areas of heathland which are afforested or have succeeded to woodland if they retain significant remnants of heathland vegetation which would enable their recovery. Areas of open freshwater (e.g. lakes, ponds, canals, rivers, streams and ditches) which support outstanding assemblages of floating/submerged/emergent plant species, invertebrates, birds or amphibians.	Medium
Chobham Place Wood	200m	SNCI	10.73	Mixed secondary woodland. Selected due to its old trees, providing potential habitat for invertebrates and birds. It is also adjacent to the Chobham Common SSSI, and provides an integral part of the habitat. For example, Hobby (<i>Falco subbuteo</i>) breeds on this site and forages over Chobham Common. Three species of woodpecker and Stock Dove (<i>Columba oenas</i>) also breed on this site.	Medium
Valley End Churchyard	200m	SNCI	0.3	Rough grassland with acid and calcareous plants present.	Medium
Whitehouse Farm Meadow	180m	SINC	Unknown	Semi-improved grasslands which retain a significant element of unimproved grassland.	Medium
Bramshot Copse	200m	SINC	Unknown	Ancient semi-natural woodland.	Medium

Ancient Woodland

8.5.4 A total of six semi-natural ancient or ancient replanted woodland areas are present within 1km of the works site. Three of these are immediately adjacent to the highway verge or within 50m of the Scheme. Refer to Table 8.4 for Ancient Semi-Natural Woodland (ASNW) sites within the Scheme extent and description.

Table 8.4: Ancient Semi-Natural Woodland Which Lie Adjacent, or Within 50m of the Scheme Extent

Site	Distance from Study Site (m)	Designation	Reason for Designation	Evaluation
Knowle Grove	Adjacent to site MP(B)36/6+40-37/0 (ch 3970-4325)	ASNW	7ha of semi-natural ancient woodland which is directly adjacent to the Highways Agency soft estate.	Lower
Oak Wood	Adjacent to Scheme MP(A)42/3+80 - 42/6+20 (ch 9700 - 9950) and MP(B)42/3+50-42/6 (ch 9675)	ASNW	5.9ha of semi-natural ancient woodland alongside the Highways Agency soft estate.	Lower
Nuns Well, Anchor Copse	20m	ASNW	5ha of which is semi-natural ancient woodland.	Lower

Classified Water Bodies

8.5.5 There are five water courses classified as surface water bodies under the Water Framework Directive (WFD) that pass under the M3 within the Scheme's extent (Table 8.5).

Table 8.5: Water Bodies Classified under the Water Framework Directive Which Run under the Site

Site	Marker Post location of the underpass	WFD status	Evaluation
The Bourne	MP(A)34/8+80 (ch 2190), MP(B)34/8+40 (ch 2150) and MP(A) 35/3+70 (ch 2700), MP(B)35/3+90 (ch 2720)	Good potential	Lower
Clappers Brook	MP(A+B) 41/3+40 (ch 8665) and MP (A+B) 42/0+50 (ch 9370)	No WFD status class	Lower
Windle Brook	MP(A+B) 44/6+20 (ch 11950)	Not classified	Lower
Cove Brook	MP(A)53/1+20 (ch 20425), MP(B)53/0+80 (ch 20390)	Moderate potential	Lower
Blackwater River	MP(A)52/6(ch 19950)	Moderate potential	Lower

Verge Habitats

- 8.5.6 The verge habitat is typically uniform within the Scheme adjacent to east and westbound carriageways. A summary of the habitat types are presented below with details in Appendix 8.2.1 and 8.8.1.

Grassland

- 8.5.7 Neutral grassland generally forms a 3 to 4m wide strip close to the hard shoulder, but behind the filter drain. Dominant species include cock's foot (*Dactylis glomerata*) and false oat grass (*Arrhenatherum elatius*), with ragwort (*Senecio jacobaea*), mugwort (*Artemisia vulgaris*), dandelion (*Taraxacum agg*), broad leaved dock (*Rumex obtusifolius*), and ribwort plantain (*Plantago lanceolata*) also common. This habitat is often degraded, sparse and scattered, with only sheltered areas forming a dense grassland sward.

Ruderal Vegetation

- 8.5.8 Tall ruderal vegetation generally occurs in a 0.5 to 1m strip behind the grassland, and is present along slip roads and scattered within bare ground. The community is composed of mugwort, bracken; creeping thistle (*Cirium arvense*), common nettle (*Urtica dioica*) and teasel (*Dipsacus spp*).

Continuous Scrub

- 8.5.9 This is the dominant habitat type towards the back of the verge and on the SRN boundary. Species include bramble (*Rubus fruticosus*), gorse (*Ulex europaeus*) and bracken (*Pteridium aquilinum*). Woodland occurs within the verge at twenty locations (Table 8.6). The habitat comprises scattered immature and semi mature trees consisting of oak (*Quercus spp*), silver birch (*Betula pendula*), ash (*Fraxinus excelsior*) and Scots pine (*Pinus sylvestris*).

Table 8.6: Areas Of Woodland Along the Highway Verge

Junction sections	Location of Woodland Along the Verge Milepost (chainage)	Carriageway
Junction 4a - 4	MP 56/0 (23310) - 55/7 (ch 23010)	A
	MP 54/9 (22210) - 54/0 (ch 21300)	A
	MP 54/8 (2210) – 54/5 (ch 21810)	B
	MP 53/2 +80 (20590) – 52/8 (ch 20110)	B
	MP 52/7 (20010) – 52/2 (ch 19520)	B
	MP 52/6 (19925) – 52/4 (ch 19725)	A
Junction 4 - 3	MP 52/2 (19520) – 51/8 + 50 ch (19150)	A
	MP 51/7 (19000) – 51/4 (ch 18700)	B
	MP 51/5 (18810) – 51/2 (ch 18510)	A
	MP 50/6 (17910) – 50/0 (ch 17325)	B
	MP 50/3 + 90 (17790) – 48/7 (ch 16020)	A
	MP 47/6 + 50 (14950) – 47/5 + 50 (ch 14865)	A
	MP 45/8 + 30 (13125) – 45/1 + 10 (ch 12430)	A

Junction sections	Location of Woodland Along the Verge Milepost (chainage)	Carriageway
Junction 3 - 2	MP 45/5 + 20 (12850) – 45/3 (ch 12640)	B
	MP 43/3 (10625) – 42/4 (ch 9740)	A
	MP 42/3 (9620) – 41/6 (ch 8920)	A
	MP 41/5 (8825) – 41/0 + 80 (ch 8400)	A
	MP 41/0 (8320) – 40/8 (ch 8125)	A
	MP 37/3 (4625) – 37/1 + 30 (ch 4450)	B
	MP 37/3 (4625) – 36/7 + 30 (ch 4050)	A

Note: A = WB carriageway; B = EB carriageway.

8.5.10 In some sections of the highway verge this uniform habitat differs. See Table 8.7 for areas of different habitat type.

Table 8.7: Areas of Different Habitat Type

Junction	Marker Post (chainage)	Habitat Type
Junction 4a - 4	On slip (A) 52/7+10 (ch 20015) - 52/7+95 (ch 20100) (A) 54/8+90 (ch 22200) - 54/5 (ch 21815) (A) 53/6+80 (ch 20990) -(A) 53/3+20 (ch 20620) (B) 53/3+20 (ch 20620) - 53/1+50 (ch 20450)	Noise barrier is up to the edge of the safety barrier; approximately 1m of short grassland is present. Behind the noise barrier the habitat consist of dense scrub and semi-mature trees.
Junction 4a	Slip road 4a adjoining	Bracken and bramble up to the edge of the hard shoulder
Junction 4a - 4	(B) 55/9 (ch 23215)- 55/4+90 (ch 22800)	1m of rough grassland followed by dense gorse, bracken and bramble.
Junction 3 - 2	(B) 43/6+80 (ch 11000) - 40/8+80 (ch 8200)	Gabion wall present for 1.5m, within these areas the habitat comprises short grassland and scattered immature trees.
Junction 3 - 2	(B) 41/3+70 (ch 8690) - 38/7 (ch 6020)	Drainage channel present for 0.5m followed by grassland and scrub.
Junction 3 - 2	(B) 40/4 (ch 7720) - 39/0 (ch 6320) (A) 40/4 (ch 7720) – 39/0 (ch 6320)	The Highways verge is approximately 0.5-1m wide consisting of short grassland with an open picket fence boundary leading onto Chobham Common. At the boundary fence there is scattered gorse for 0.25m. Beyond the fence line there is approximately 25m of short cut grassland along both carriageways.
Junction 3 - 2	(B) 38/8+50 (ch 6175)- 37/5+50 (ch 4875)	Narrow verge, scattered immature trees with grassland understorey.

Junction	Marker Post (chainage)	Habitat Type
Junction 2	(B) 34/1+25 (ch 1450)	Scrub immediately adjacent to the edge of carriageway.

Kitsmead Lane Gantry Laydown Area and Construction Compound

Habitats

- 8.5.11 Habitats on site largely comprise semi-mature broadleaved woodland, scrub, ephemeral/short perennial and tall ruderal habitats.
- 8.5.12 The site is bordered on the north, east, west and south eastern side by semi mature broadleaved woodland. Species recorded included silver birch (*Betula pendula*), sweet chestnut (*Castanea sativa*), Scots pine (*Pinus sylvestris*), pendunculate oak (*Quercus robur*), aspen (*Populus tremula*) and tutsan (*Hypericum androsaemum*). Dominant bracken (*Pteridium aquilinum*) was recorded surrounding a northern section of woodland (TN2).
- 8.5.13 Dense and scattered scrub habitats, dominated by silver birch, buddleia, grey willow (*Salix cinerea*), bramble (*Rubus fruticosus*), were recorded across the site.
- 8.5.14 A large area of ephemeral/short perennial habitat was recorded in the centre of the site (see Figure 1 in Appendix 8.11.1). Abundant sticky fleabane (*Dittrichia viscosa*) a non-native species was recorded, along with frequent common fleabane (*Pulicaria dysenterica*) and Canadian fleabane (*Conyza canadensis*).
- 8.5.15 The non-native invasive Japanese knotweed was recorded on site.

Protected and Otherwise Notable Species Records

- 8.5.16 A table of protected and/or otherwise notable species recorded within 1km of the site boundary provided by SBIC and HBIC are provided within Appendix 8.1.1 Ecological Desk Study. Species records obtained from the Highways Agency in January 2013 are presented in Appendix 8.1.2.

Heathland Birds

- 8.5.17 Maps showing the distribution of breeding territories for nightjar, woodlark and Dartford warbler were obtained for Chobham Common and Bagshot Heath, the two areas of the Thames Basin Heath SPA which border the M3 at MP(A)38/9+80 (ch 6300) to MP40/4+30 (ch 7750) and MP(B) 38/9+80 (ch 6300) to MP40/8+40 (ch 8175) respectively. The maps are presented as Figure 8.3 for Chobham Common and Figure 8.4 for Bagshot Heath.

Chobham Common

- 8.5.18 Data was received for Chobham Common covering the 2007 and 2012 bird breeding season. North of the M3 the nearest nesting locations for Dartford warbler was 70m from the motorway in both 2007 and 2012, whilst to the south the closest territory was approximately 100m, also in 2007. The number of Dartford warbler territories at Chobham Common as a whole in 2012 was a fraction of that recorded in 2007, probably due to prolonged cold conditions during the winter and/or poor weather in the period March to June which lead to lower breeding success.

- 8.5.19 In 2007 the closest breeding territories for nightjar were approximately 100m away on the north side and 140m on the south side. As for Dartford warbler, the number of breeding territories in 2012 were much lower than 2007, probably due to poor weather. The nearest territories in 2012 were 280m away. For woodlark the nearest breeding territory was also in 2007 and was 525m away on the north side of the motorway.

Bagshot Heath

- 8.5.20 Data was received for Dartford warbler and nightjar covering the 2008, 2010, 2011 and 2012 breeding season. A total of 16no. Dartford warbler territories were recorded on the site in 2008, whilst none were recorded in 2010, 2011 and 2012. As for Chobham Common this is likely to be due to prolonged cold weather conditions during preceding winter, or poor weather during breeding season. The closest breeding territory in 2008 was approximately 67m from motorway. The motorway is in cutting at this location and suitable heathland habitat is separated from the motorway by a steep wooded bank.
- 8.5.21 Small numbers of nightjar territories were recorded at the site (one in 2008, one in 2012, two on 2011 and two in 2012). The closest was recorded in 2010 approximately 150m from the motorway.

Other Breeding Birds

- 8.5.22 A total of 14 bird species of conservation concern have been recorded within approximately 1km of the works boundary. These include Barn owl (*Tyto alba*), Dartford warbler, Nightjar, Woodlark and Green sandpiper (*Tringa ochropus*). A further 28 notable bird species occur within 1km of the Scheme extents.

Mammals- Otters and Water Voles

Desk Study

- 8.5.23 Two records of otter have been recorded within 1000m of the Scheme extents in 2004/2005 at the Blackwater River. Nine records of water vole have been recorded between 100m and 1000m of the Scheme extents during the years 2000 and 2002 in Chobham Common, Lightwater (Visitor centre), Pirbright Ranges and close to Windle Brook and Rushy pond and north of the M3 above 37/9 (ch 5225) adjacent to Longcross station. None of the records occur within the SRN boundary, although the Blackwater River and the Windle Brook both cross the Scheme.

Field Study

- 8.5.24 Otter and water vole habitat suitability assessments were conducted in November 2009 and in March 2012. Six watercourses were identified as having the potential to support otters and five watercourses were identified as potentially suitable for water voles. Only one water course was identified as being potentially affected as a result of the proposed works, Cove Brook. No evidence of otter or water vole was observed on this watercourse, although it has the potential to be used for otter passage. The results of these surveys are presented in Appendix 8.5.1.

Mammals- Bats

Desk Study

- 8.5.25 A number of bat species have been recorded with 1km of the proposed works including common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), daubenton's (*Myotis daubentonii*) and noctule (*Nyctalus noctula*). One structure within the Scheme extents, Fromows Underpass (situated at MP 45, ch12325 on both sides of the carriageway), has been previously assessed as having high potential to support roosting bats.

Field Study

- 8.5.26 Bat surveys were conducted in June 2010 to assess the potential of existing structures within the Scheme extents to support roosting, foraging and commuting bat species. A total of six bat species were recorded. The results of these surveys can be found within Appendix 8.3.1
- 8.5.27 Supplementary bat surveys were conducted in March 2013 to assess the bat roost potential of all existing structures and tree roost potential areas within and adjacent to the Scheme area. Results are presented in Appendix 8.3.2.
- 8.5.28 A total of 26 bridge structures were assessed for bat roost potential. No bridges were assessed as having moderate or high potential or confirmed roosts present. Nine bridges were assessed as having low potential. Refer to Figures - Bat Roost Potential and Bat Survey Report located in Technical Appendix 8.3.2 for location, photographs and description of bat roost potential.
- 8.5.29 A total of 82 locations along the Scheme extents were assessed for tree roost potential. These locations consisted of Superspan Portal, Single Span Portal, Long Span Cantilever, Bendy Pole Cantilever, Cantilevers and Emergency Refuge Areas (ERA) which have been proposed as part of the Scheme. A comprehensive list of these areas can be seen in Appendices 8.9 to 8.11. Out of the 82 locations surveys a total of 17 trees were assessed for bat roost potential following the BCT methodology.
- 8.5.30 All trees assessed were within close proximity to the proposed works. Tree species consisted of oak (*Quercus robur*), Crack willow (*Salix fragilis*), beech (*Fagus sylvatica*), silver birch (*Betula pendula*) and Leyland cypress (*X Cupressocyparis leylandii*). Only one tree was assessed as having moderate potential to support roosting bats, this tree is situated outside of the works footprint beyond the noise barrier at MP43/6 (ch10920) and therefore is unlikely to be impacted upon by the proposed works. The majority of trees showed no feature suitable to support roosting bats and therefore had no potential to support roosting bat species.

Mammals- Dormice

Desk Study

- 8.5.31 No records of dormice had previously been recorded within 1km of the Scheme extents.

Field Study

- 8.5.32 A dormice habitat suitability assessment was conducted in 2010. Seven sites were identified as potentially suitable. Following this assessment nest tube surveys were conducted at six sites across the Scheme extents (the seventh site was closed within a traffic management area) in the summer of 2010. No evidence of dormice was found. The results of these surveys can be found within Appendix 8.4.1

Mammals- Badgers

Desk Study

- 8.5.33 There were no previous records of badgers within 1km of the Scheme extents.

Field Study

- 8.5.34 Surveys were conducted in 2009 to assess the verge and a 20m buffer zone for badger field signs and active setts. The surveys were completed using the survey methods recommended in the DMRB guidance (Highways Agency 2005). All identified setts were noted and a category assigned according to the method described by Harris et al (i.e. main, annexe, subsidiary and outlier) as well as classification of disused, partially used and well-used holes. One active subsidiary sett and seven outlier setts were identified within the survey area.
- 8.5.35 A full re-survey of the Scheme extents and 20m buffer zone was undertaken in 2012 using the same methodology. Three main setts, three subsidiary setts and three outliers were recorded. A further four setts appeared to not be active at the time of the survey.
- 8.5.36 Supplementary badger surveys were conducted in February 2013 to update existing information and assess the potential impact of the proposed gantries upon known setts which were within close proximity. All setts identified in 2012 were re-assessed using the Harris et al methodology with particular attention to the position of sett entrances and likely direction of tunnels relative to proposed gantry locations.
- 8.5.37 A total of nine mammal holes were identified. Two active outlier setts and a partially used outlier sett were recorded within the proposed working area for the scheme. A further six setts recorded as active in 2012 were found to be disused, including a main sett consisting of nine entrances.
- 8.5.38 Relevant qualified professionals may obtain further information in relation to the badger surveys upon request from the Highways Agency Environmental Team.

Amphibians- Great Crested Newts (GCN)

Desk Study

- 8.5.39 Four records of GCN were recorded by the Highways Agency in 2008 situated around MP (A) 37/0 (ch 4325). Records of common amphibian species such as smooth newt (*Lissotriton vulgaris*) palmate newt (*Lissotriton helveticus*), common frog (*Rana temporaria*) and common toad (*Bufo bufo*) have been recorded between MP37/0 (ch4325) - 44/9 (ch12210) carriageway A (westbound).

Field Study

- 8.5.40 A Habitat Suitability Index (HSI) of all ponds situated within 250m of the proposed Scheme was conducted in March 2009. This followed the survey methodology by Oldham et al 2000 to assess the ponds potential to support GCN. A total of 16 ponds were identified as having a HSI score above 0.5 including two ponds which were identified by a land owner to contain GCN. A total of 13 ponds were surveyed as being unlikely to support GCN, one pond as having a 'low' population and two ponds containing a 'medium' population. The results of these surveys can be found within Appendix 8.6.1.
- 8.5.41 Population estimate surveys were conducted at four ponds, pond 5, pond 7a, 7b and standing water pond between mid-March and June 2013. A total of 6 surveys were conducted using bottle traps, torching and egg searching methods.
- 8.5.42 Great crested newts were recorded within pond 5, 7a and 7b. Peak counts were 2, 2 and 10 respectively. Based on the Great Crested Newt Mitigation Guidelines, all three ponds were considered to support a small population size class (Maximum count of 1-10 individuals). It is therefore reasonable to assume that great crested newts will use suitable terrestrial foraging habitat close to the ponds and will not venture onto the highway verge. Ponds 7a and 7b are also separated from the motorway verge by a race track which is likely to represent at least a partial physical barrier.
- 8.5.43 No great crested newts have been recorded within standing water pond. Only smooth newts were observed with a peak count of six. This pond dried up after visit 2, therefore a full survey assessment could not be conducted, however due to nature of the water body it is unlikely to support great crested newts.
- 8.5.44 Palmate newts were recorded in high numbers at Pond 7a (Appendix 8.6.2) with peak adults counts at 59. A high number of common toads was observed in Pond 5 with peak counts of 69 adults. Smooth newts were recorded in all ponds however 7b had the greatest number with a peak count of 20 adults.

Rare Reptiles

Desk Study

- 8.5.45 Seven records of smooth snake were recorded by the Highways Agency in 2008 around MP 46/3+50 (ch13670). Further records were made by the Surrey Amphibian and Reptile Group between 2008 and 2009; a total of 16 smooth snakes have been recorded within 50m to 1000m of the Scheme extent. Three records of Sand lizard have been recorded within 350m to 1000m of the Scheme.
- 8.5.46 Numerous common reptile species including slow worm, common lizard, adder and grass snake have been recorded within the highway verge and within 1km of the Scheme extents.

Field Study

8.5.47 Rare reptile surveys were conducted at two sites along the highway verge adjacent to Chobham Common and Bagshot Heath at MP 40/8 (ch 8125) and 41/0 (ch 8320) on both carriageways (A+B) in April 2012. Two methodologies, refugia searches and visual encounter surveys were used. No smooth snakes or sand lizards were recorded during the surveys. Low populations of common lizards and slow worm were present on the verge of carriageway B (eastbound) adjacent to Chobham Common. The results of these surveys can be found within Appendix 8.7.1.

Common reptiles – Kitsmead Lane gantry laydown area and construction compound

8.5.48 No reptiles or signs of reptiles were recorded during the surveys. A total of 18 common toads (*Bufo bufo*), two common frog (*Rana temporaria*) and four common field vole (*Microtus agrestis*) were recorded under refugia during the surveys.

Evaluation of Protected and Otherwise Notable Species Receptors

8.5.49 The value of protected and/or otherwise notable species, as determined on the basis of the desk studies and surveys undertaken, is summarised in Table 8.8.

Table 8.8: Species Receptor Values

Receptor	Evaluation
Breeding heathland birds	Verge habitat: Lower
	Adjacent habitat (Chobham Common): Very high
Other breeding birds	Lower
Otter	Lower
Dormouse	Negligible
Bats (all species)	Medium
Badger	Lower
Water vole	Lower
Great crested newt	Medium
Rare reptiles	Verge habitat: Lower. Bagshot Heath – Very high
Common reptiles	Lower

8.6 Mitigation and Detailed Scheme Development

Scheme Details

8.6.1 The Scheme is described in detail in Chapter 2: The Scheme. The following design refinements incorporated into the Scheme during its development aim to minimise impacts on ecological receptors within and adjacent to the highway boundary.

- 8.6.2 It will be an 'All Lane Running Scheme (ALR)' which means that all four running lanes (including what was the hard shoulder) are open to traffic at all times. Compared to a dynamic Hard Shoulder Running (HSR) Scheme, which has been installed elsewhere on the motorway network, ALR will require less technology and this therefore minimises impacts within the verge.
- 8.6.3 There will be no encroachment into the existing verge in order to create the fourth running lane. Instead there will be narrowing of the central reserve with a Concrete Barrier. Infrastructure in verges will therefore be limited to locations associated with ERAs, gantries, ducts, signs, cabinets and chambers.
- 8.6.4 Proposed new infrastructure within Chobham Common SSSI which borders the M3 has been minimised. The following specific design refinements have been made:
- The existing carriageway edges at the verges, and surface water drainage system would be retained;
 - SOS phone signs would be located at non-standard distances in order to reduce the number within Chobham Common SSSI from four to three;
 - There are to be two 15m high CCTV poles within the verge, one located at the end of the SSSI boundary; and
 - Cabling ducts, cabinets and chambers within the verge have been minimised with one small cabinet located behind the existing crash barrier next to Windsor Road overbridge.
- 8.6.5 Potentially significant effects were also identified on smooth snake due to the proximity of the running land to adjacent habitat at Bagshot Heath (MP (A) 45/9 (ch 13225) to MP (A) 46/9 (ch 14200). 473m of permanent reptile fencing will be installed adjacent to the westbound carriageway in order to minimise the risk of reptile mortality (notably smooth snake within the section adjacent to Bagshot Heath).

Construction

- 8.6.6 Construction activities and methods are currently under development through consultation with the design team and Contractor. The following activities are envisaged by the Contractor within the highways boundary:
- Site clearance where necessary for temporary and permanent works.
 - Installation of traffic management measures.
 - Levelling ground to accept temporary CCTV bases.
 - Placing of temporary signs in the verge.
 - If necessary, alterations to the drainage to prevent flooding of the hard shoulder whilst in use by traffic.
 - Temporary lighting.
 - Construction traffic passing through 24hrs per day.
 - Planing out of the hard shoulders and re-instatement with the subsequent verge works to tie back in.
 - Cold milling and surfacing the carriageway.
 - Construction of permanent works.

- 8.6.7 Where necessary a strip of verge approximately 0.5m wide, immediately adjacent to the existing hard shoulder, will be temporarily hardened whilst works to narrow the central reserve takes place. This is because the running lanes will be narrowed during this period, and the hardened strip will ensure that traffic does not stray onto the soft verge.
- 8.6.8 Within Chobham Common SSSI, no hardening will be required adjacent to the westbound carriageway as there is an existing concrete drain. On the eastern carriageway there will be temporary hardening of a 50cm strip immediately adjacent to the hard shoulder to minimise the risk of the carriageway edge collapsing during narrow lane running. A geotextile membrane will be laid beneath the tarmac on this 0.3m strip to minimise mixing of the underlying soil with sub-base material and tarmac. On removal of the tarmac and geotextile, the underlying soil will be loosened, but not reseeded to allow natural colonisation by acid grassland vegetation. Outside Chobham Common, the 0.5m strip will be restored through loosening of the soil and re-seeding.
- 8.6.9 A temporary construction compounds will be located adjacent to carriageway A (westbound) at Kitsmead Lane, near Trumps Farm [MP 36/8 to 37/2]. The compound will be used as a gantry storage and general laydown area. It will be accessed directly from the motorway at around MP 37/3 beneath Kitsmead Lane overbridge.
- 8.6.10 In addition, the following will be employed in the construction methodology of works:
- There will be no temporary work compounds or vehicle access routes on the verge throughout the sections bordering the statutory designated sites. Given the nature of the infrastructure, plant will comprise small excavators.
 - Disturbance will be limited to the area immediately around the excavations.
 - Any disturbed ground will be re-instated and 'made good' on completion.
 - Plant will not be tracked up and down the verge, but will use the hard shoulder to move between new infrastructure positions.
 - Construction noise and lighting will be controlled through standard Highways Agency good practice. Any special measures agreed between the Highways Agency and Natural England for Chobham Common will be implemented.
 - Any activities or plant which could give rise to sparks or represent a fire risk will not be used.
- 8.6.11 Impacts during construction would be controlled through the CEMP. The following measures of relevance to ecology are presented in Table 8.9.

Table 8.9: Summary of Construction Mitigation Measures

Control Measure	Relevant Ecological Receptor
All site works will be carried out in accordance with best environmental working practices e.g. CIRIA publications.	All
Spill kits to be available on site and all staff to be trained in how to use emergency response equipment.	All

Control Measure	Relevant Ecological Receptor
Polluting materials will not be stored in works areas located within areas of significant biodiversity value, particularly within 50m of watercourses.	Waterbodies
Methods to minimise/prevent contamination of watercourses during the construction works will be implemented. The EA's Pollution Prevention Guidance (PPG) 5 should be adhered to in order to prevent damage and/or pollution to aquatic habitats.	Waterbodies
Any works that disturb drainage features must include for any necessary mitigation or reinstatement to ensure the features retain their correct working function.	Waterbodies
Any works that disturb drainage features must include for any necessary mitigation or reinstatement to ensure the features retain their correct working function.	Waterbodies
Retention of as many trees as possible with reference to the undertaking of any essential tree surgery to the crown or roots in accordance with British Standard (BS) 3998:2010 Tree Work Recommendations and appropriate Arboricultural Association advice notes, along with the protection of trees, with particular attention when adjacent to ancient woodland, in accordance with BS 5837:2005 Trees in Relation to Construction Recommendations, Arboricultural Association and Forestry Authority Advice Notes, and the National Joint Utilities Group Guidelines for the Planning, Installation and Maintenance of Utility Services in Proximity to Trees.	Woodland habitats
The presence of significant ecological receptors would also have implications for the timing of the development work. The avoidance of periods of particular sensitivity is considered best practice for protected species such as nesting birds, reptiles and amphibians.	Breeding birds, reptiles and amphibians
A watching brief should be maintained as appropriate (for example, in areas known to represent optimum reptile habitat). If any protected species are found, then works close by should cease until the ecologist has been contacted to advise on how to proceed.	Breeding birds, mammals, amphibians and reptiles
All trenches and work excavations should be covered overnight or fenced off to prevent animals falling in, or trenches should include an earth ramp to allow animals to climb out.	Mammals, reptiles and amphibians
Potential location of laydown area in vicinity of identified ponds with GCN population. If location is confirmed in the vicinity of these ponds, a GCN licence would be required to ensure GCNs are excluded from the potential laydown area to avoid injury or killing.	Great Crested Newts
Areas of verge temporarily disturbed should be reinstated once works are completed, to enable habitats to regenerate naturally.	Verge habitats

Control Measure	Relevant Ecological Receptor
Post construction planting should aim to enhance the ecological value of the Highways Agency soft estate in the vicinity of the Scheme. This could include re-instating and re-linking severed linear wildlife corridors with new planting. Consideration should be given to the inclusion of locally sourced native plant species within planting proposals and the application of sensitive management and monitoring regimes.	Verge habitats
Short term airborne pollution resulting from site vehicle emissions and dust will be controlled through best practice measures such as wetting, if dictated by very dry weather condition.	Verge and adjacent habitats
Appropriate measures will be taken to avoid the spread of invasive and non-native plants. Stands of invasive plants (including Japanese knotweed and Himalayan balsam) will be fenced off at an appropriate distance. Appropriate measures will be adopted within the Kitsmead Lane to prevent the spread of the non-native plant sticky fleabane.	Invasive plants
Pre-construction survey of badger setts to determine activity prior to sett closure. Sett closure will commence once setts have been confirmed disused. Any setts which are active will require a licence in order to close the sett.	Badgers
Temporary fencing will be erected at a distance of approximately 20m around active badger setts to prevent construction works causing damage and disturbance to setts.	Badgers

8.7 Magnitude of Impacts

Construction Stage Impacts

8.7.1 This section describes the types of impacts that would affect ecological receptors during the construction stage of the project. Species specific impacts are detailed in the survey reports in Appendices 8.3.1 to 8.7.1. Temporary and permanent land take will take place during the construction stage and therefore effects arising from it are considered in this section.

8.7.2 The following generic impacts may be expected to occur during the construction stage:

- Temporary and permanent land take;
- Disturbance and compaction due to vehicle and plant movements causing damage to habitats and potential mortality of reptiles and other fauna;
- Noise and light pollution arising from construction activity causing disturbance to sensitive species; and
- Changes to drainage and the hydrological regime in the vicinity of the motorway.

Temporary and Permanent Land Take

- 8.7.3 There would be temporary and permanent loss of habitat within the highway boundary in order to install ERAs, gantries, ducts and chambers, noise barriers, and temporary and permanent signs. Permanent loss is considered to be existing areas of habitat that would be lost beneath the footprint of an individual structure. Temporary loss would occur around each structure within the working area required to construct it.
- 8.7.4 There will be 12 ERAs, each approximately 1066m² in size. A further 851m² of temporary land take per ERA will be required during construction. There will be 55 gantries of which 17 would have foundations in the verge on both sides of the motorway (superspan portals). The remainder would have foundations of approximately 174m² on one side. The cabinets and chambers will be approximately 0.5m x 0.5m in size. Cross carriageway ducts will be installed in trenches across the width of the road, with an approximate 3m x 3m working area within the verge at either end of the duct.
- 8.7.5 Noise barriers will be installed at a number of locations within the Scheme. There would be a total of 6 no. barriers located on the verge adjacent to the west bound carriageway, totalling 1.27km, and 10 no. barriers adjacent to the eastbound carriageway totalling 1.96km. In some cases this will represent replacement of existing noise barriers. Further details of proposed new barriers are provided in Chapter 10 - Noise and Vibration. The working width for installing noise barriers will be 4m.
- 8.7.6 There will also be temporary land take associated with the construction compound at Kitsmead Lane.
- 8.7.7 The impact of temporary land take is considered to be minor negative. The impact of permanent land take is also considered to be minor negative.

Disturbance due to Human Activity

- 8.7.8 There will be an increased level of human activity within the verge and close to the highway boundary during construction. Certain construction activities, such as the installation of traffic management, will take place at night in order to minimise disruption and will entail human activity on the verge. Disturbance can lead to the displacement of sensitive receptors such as birds and reptiles. The impact of disturbance is considered to be minor negative in magnitude.

Soil Compaction

- 8.7.9 With the implementation of controls on vehicle and plant movements as identified in Section 8.6 above, compaction of soil due to construction vehicle movements during construction will largely be confined to the temporary land take areas. There will be compaction of the soil underlying the 0.5m strip of the verge which will be temporarily hardened whilst the central reserve is being narrowed. The impact of compaction is considered to be minor negative.

Noise and Light Pollution

- 8.7.10 Noise impacts during construction will occur as a result of the operation of plant and equipment, and potentially as a result of changes to the pattern of vehicle movements and speeds. The works with the potential to result in the most significant noise impacts are the earthworks and the piling required for gantries and ERAs. Certain construction activities, such as installation of traffic management measures and cold milling and surfacing of carriageways will take place at night to minimise traffic disruption.
- 8.7.11 Lighting will be required for night time construction activities. It will comprise temporary lighting columns at the specific locations where works are taking place, and vehicle mounted flashing lights. Fixed lighting will be cowled in order to minimise spillage beyond the road verge. Given the existing lighting from vehicle headlights and matrix signs the impact of lighting during construction is considered to be minor adverse.

Changes to Drainage and the Hydrological Regime in the Vicinity of the Motorway

- 8.7.12 The existing outfalls will be maintained and no permanent changes to the hydrological regime are anticipated.

Operational Stage Impacts

- 8.7.13 The following impacts are likely to occur during the operational stage of the Scheme:
- Increased deposition of nitrogen and other airborne pollutants due to a deterioration in air quality from increased traffic volumes;
 - Increase in noise levels in adjacent habitats due to proximity to running traffic.
 - Increased lighting due to additional matrix signs;
 - Increased mortality of some species due to increased traffic volumes and proximity of running lanes to adjacent habitat;
 - Increased human disturbance associated with emergency refuge areas.

Deterioration in Air Quality

- 8.7.14 Traffic volumes on the M3 are predicted to increase with and without development scenarios. As a result NO_x concentrations in the vicinity of the motorway are already high, and by 2015 will be well in excess of the critical level above which effects on vegetation may occur. Predicted NO_x concentrations and nitrogen deposition rates have been calculated for statutory and non statutory sites within the study area, and effects are discussed below for each site. Impacts on air quality are thus considered to be minor adverse.

Increase in Noise Levels in Adjacent Habitats

- 8.7.15 Construction noise arising from the scheme been modelled for specific sensitive locations such as Chobham Common based on generalised noise source levels for specific operations such as cold milling and surfacing. Existing noise levels in the vicinity of the motorway are already high. For example, at Chobham Common, total noise level during construction (existing background plus construction noise) would raise overall noise levels at 70m from the roadside during the construction period by less than 3 dB as a worst case.

- 8.7.16 Operational noise has been modelled for a 'with' and 'without' scheme scenario in 2015 and 2030 as part of the EAR. Some increases in noise are anticipated immediately adjacent to the motorway with the scheme in operation, although the introduction of noise barriers also leads to a decrease in some locations. Noise contour plans of the scheme have been used as a basis for the assessment of noise impacts on statutory and non-statutory sites, and species such as breeding birds using undesignated habitats. The impact of construction and operational noise is thus considered to be minor adverse.

Increased Run Off and Spray from Highway due to Displacement of Water by Traffic Running on the Hard Shoulder

- 8.7.17 Surface water will continue to be collected in filter drains adjoining the hard shoulder, although levels of spray being carried beyond the hard shoulder may increase. This could lead to an increased risk of waterlogging in adjacent habitats where the existing verge is narrow. Furthermore, there may be increased salt penetration in soils within the affected areas. The magnitude of this impact is difficult to predict without further data.

Increased Mortality of Some Species due to Increased Traffic Volumes and Proximity of Running Lanes to Adjacent Habitat

- 8.7.18 The motorway currently represents a barrier to movement and increases in traffic volumes are unlikely to increase mortality rates significantly above existing levels. However, the hard shoulder currently acts as a buffer for animals using the verge habitat straying on to the highway. It may serve to reduce mortality rates. This buffering effect will be significantly reduced by the All Lane Running Scheme. The magnitude of the impact is considered to be minor to moderate negative.

Increased Human Disturbance Associated with ERAs

- 8.7.19 It is assumed that use of ERAs will be carefully managed for safety reasons to restrict the duration of stay by individual vehicles. Nevertheless, there is potential for increased levels of disturbance and littering associated with ERAs. The impact is considered to be neutral to minor negative.

8.8 Assessment of Effects

- 8.8.1 The following section discusses the ecological effects that would occur during the construction and operational stages of the project. A detailed assessment of the impacts that would occur on sites protected under the EU Habitats Directive (Special Areas of Conservation (SAC)) and EU Birds Directive (Special Protection Areas (SPA)) is presented in the Assessment of Impacts on European Sites (AIES) report. A summary of the impacts is presented below.

Statutory Designated Sites- Thursley, Ash, Pirbright and Chobham Common SAC

Construction Effects

Permanent and Temporary Land Take

- 8.8.2 Thursley, Ash, Pirbright and Chobham SAC is a conglomerate site, made up of fragmented sites, including Chobham Common and Bagshot Heath. Two areas of the SAC are immediately adjacent to the M3. Chobham Common for 1.9km of its length between Junctions 2 and 3, and Bagshot Heath for a further 1km between Junctions 3 and 4. The highway verge lies within the boundary of the SAC through Chobham Common.
- 8.8.3 During construction works the eastbound verge will require some hardening to prevent traffic from straying off the carriageway during narrow lane running. This will involve removing soil to a depth of approximately 30cm from a 50cm wide strip and replacing it with concrete on a membrane. The strip will be re-instated with appropriate substrate post-construction and sown with heathland/acid grassland seed, preferably harvested from Chobham Common itself. There is an existing drain adjacent to the hard shoulder on the westbound carriageway and therefore no hardening is required along the westbound verge.
- 8.8.4 In addition, at Chobham Common there will be around 440m of buried ducting. The trench in which the duct will be buried will be approximately 0.5m wide and will be backfilled once the duct is installed. It is therefore a temporary impact. The habitat affected is already degraded with sparse vegetation cover and once infrastructure is installed, the verge can be restored so that the permanent land take will be a fraction of the temporary loss.
- 8.8.5 During construction, there will also be temporary land take for temporary road signs, etc. Temporary land take during construction will result in the temporary loss of approximately 0.09ha from the highway verge, which represents approximately 0.002% of the total SAC site.
- 8.8.6 The verge adjacent to Bagshot Heath has two gantries proposed at ch 13489 and ch 14089, which will also require associated cabinets and cabling. All works will be within the SRN boundary.
- 8.8.7 While part of the SAC, the verge is botanically degraded due to its location and has few heathland or acid grassland species containing a large percentage of bare ground and being dominated by species typical of more mesotrophic habitats.
- 8.8.8 There are three proposed advanced SOS signs, two proposed CCTV poles, one small electrical cabinet, and 6 buried chambers with manhole covers which will cause permanent land take (within the highway boundary) and with a total footprint of approximately 10m².
- 8.8.9 The small percentage of land take is not anticipated to have a significant effect on the integrity of the SAC. The impact of temporary land take is considered to be minor negative. Given the very high value of the site, the overall effect is slight adverse and permanent.

- 8.8.10 Land take during construction are shown on Figures 8.5 Temporary land take areas. These figures include the permanent land take from the gantry and EAR infrastructure and the temporary work footprint around the structures during construction.

Disturbance and Degradation of Habitats

- 8.8.11 There will be no physical disturbance to habitats beyond the highway boundary. Construction activity will be limited to those areas discussed in relation to temporary land take above. Construction may lead to increased levels of dust in the local vicinity of the M3. However, construction of new infrastructure has been restricted in areas adjacent to the SAC so dust generation is likely to be minimal. Measures such as damping down of the works area during construction to reduce the spread of dust will be implemented if necessary. No significant effects on the SAC are therefore anticipated from dust or other construction impacts.

Operational Effects

Increased NO_x and Nitrogen Deposition due to Reduced Air Quality

- 8.8.12 Air quality data indicate that background oxide of nitrogen (NO_x) concentrations within 200m of the M3 at Chobham Common are already high, and by 2015 (without the M3 scheme in operation) will range from 82.9 µgm⁻³ at the roadside to 36µgm⁻³ at 200m from the roadside.. This is compared to a critical level for NO_x of 30µgm⁻³, the concentration above which effects on vegetation may occur. For a zone within 10m of the roadside, NO_x concentrations would increase by 7% as a result of the Scheme compared to the 2015 baseline without the Scheme. Beyond 10m the increase would fall below 5%. Given the high background concentrations without the Scheme this increase is unlikely to have a detectable direct effect on the vegetation even close to the roadside as NO_x is already present in excess adjacent to the road.

Nitrogen Deposition

- 8.8.13 The Design Manual for Roads and Bridges (Interim Advice Note 174/12 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality (HA207/07)) states that where the change in NO_x concentrations would exceed 1% of the critical level (i.e. 0.3 µgm⁻³), nitrogen deposition rates should be calculated in order to determine whether they exceed 1% of the critical load for the relevant habitat as a result of the scheme. Since air quality calculations indicate that the change in NO_x concentrations as a result of operation of the Scheme compared to 2015 without the scheme will exceed 1% of the Critical Level (30 µgm⁻³) nitrogen deposition must be calculated.
- 8.8.14 Nitrogen deposition is measured in terms of a critical load, which varies according to habitat type. For heathland, the critical load range for nitrogen deposition begins at 10 kg N ha⁻¹ yr⁻¹. Contributions of nitrogen which exceed 1% i.e. 0.1kg N ha⁻¹ yr⁻¹ need to be considered in further detail to determine whether alone or in combination with other inputs they may give rise to a an adverse effect.

- 8.8.15 Air quality calculations indicate that the change in NO_x concentrations as a result of operation of the scheme compared to 2015 without the scheme will exceed 1% of the Critical Level (30 µgm⁻³) throughout the zone within 200m of the roadside. The exceedance is greatest closest to the road (20.7% of the critical level at the roadside) and declines with distance from the road to 1.6% of the critical level at 200m from the roadside. Therefore contribution to nitrogen deposition must be calculated.
- 8.8.16 The change in nitrogen deposition rate due to the operation of the scheme will be at or below 0.1 kg N ha⁻¹ yr⁻¹ at all points on the transect, except within 30m of the roadside where it will increase by between 0.12 kg N ha⁻¹ yr⁻¹ (at 30m) and 0.24 kg N ha⁻¹ yr⁻¹ (at 10m). This is equivalent to 1.2 - 2.4% of the critical load, which using the magnitude of change criteria set out in the Design Manual for Roads and Bridges would be a 'small' magnitude change (i.e. not exceeding 5% of the critical load).
- 8.8.17 Between 2013 and 2015 an increase in nitrogen deposition within 20m of the M3 of 1.98 to 2.83 kg N ha⁻¹ yr⁻¹ is predicted as a result of background traffic growth, with the greatest rate being at the roadside. This would become a 2.11 - 3.00 kg N ha⁻¹ yr⁻¹ increase when the M3 scheme is factored into consideration.
- 8.8.18 Research⁵ shows that as background nitrogen deposition rates increase, adding more nitrogen has less and less effect because nitrogen ceases to be a limiting nutrient. More competitive species typical of more nutrient enriched habitats already have sufficient nitrogen to compete such that nitrogen availability ceases to be limiting to their growth. Adding further nitrogen in such a situation therefore has a much smaller effect on diversity than it would if the total background nitrogen deposition rate was low.
- 8.8.19 It is possible that the species richness of the band within 20m of the M3 may decline slightly as a result of the overall increase in nitrogen deposition predicted by 2013, although over 90% of this increase will be attributable to sources other than the M3 scheme and over 98% of all nitrogen deposited within 20m of the roadside will be attributable to sources other than the M3 scheme. Nitrogen deposition due to the M3 scheme is thus considered to have a negligible effect on habitats within the SAC.

Increased Salt Deposition due to Spray from Vehicles

- 8.8.20 With the loss of the hard shoulder spray from vehicles is likely to be carried onto surrounding vegetation rather than remaining on the carriageway. Salt dissolved within vehicle spray has the potential to increase salinity levels in soils within the affected zone, leading to changes in the vegetation composition. Species such as Danish scurvy-grass (*Cochlearia danica*), a non-native, salt tolerant species that is now widely associated with road verges in the UK.

⁵ Stevens, C. J.; Dise, N. B.; Gowing, D. J. G. and Mountford, J. O. (2006). Loss of forb diversity in relation to nitrogen deposition in the UK: regional trends and potential controls. *Global Change Biology*, 12(10), pp. 1823–1833.

Southon GE, Field C, Caporn SJM, Britton AJ, Power SA (2013) Nitrogen Deposition Reduces Plant Diversity and Alters Ecosystem Functioning: Field-Scale Evidence from a Nationwide Survey of UK Heathlands. *PLoS ONE* 8(4): e59031. doi:10.1371/journal.pone.0059031

Stevens, Carly; Dupre, Cecilia; Dorland, Edu; Gaudnik, Cassandre; Gowing, David J. G.; Bleeker, Albert; Diekmann, Martin; Alard, Didier; Bobbink, Roland; Fowler, David; Corcket, Emmanuel; Mountford, J. Owen; Vandvik, Vigdis; Aarrestad, Per Arild; Muller, Serge and Dise, Nancy B. (2010). Nitrogen deposition threatens species richness of grasslands across Europe. *Environmental Pollution*, 158(9), pp. 2940–2945.

- 8.8.21 The existing verge vegetation within Chobham Common is affected by disturbance and nitrogen deposition from the road. Given that the vegetation community is dominated by vigorous grasses and ruderal species such as bramble, it is considered unlikely that the community will change significantly as a result of any minor increases in salt deposition. Overall, the effect is considered to be slight adverse.

Statutory Designated Sites- Thames Basin Heaths SPA

Construction Effects

Temporary and Permanent Land Take

- 8.8.22 As for the Thursley, Ash, Pirbright and Chobham Common SAC the SPA boundary includes the verge (~0.5m) and stops at the edge of the hard shoulder. There will be approximately 0.09 ha of land take associated with works in the verge, including a maximum of 930m² (0.093ha) temporary land take and 10m² permanent loss for sign foundations and chambers. This represents approximately 0.001% of the total SPA site and 0.01% of the total area of the Chobham Common component.
- 8.8.23 Land take is not anticipated to have a likely significant effect on the SPA due to the very small percentage of the SPA affected and the location immediately adjacent to the road (and therefore in an area that is not used by SPA birds).

Disturbance due to Noise, Human Activity and Light Pollution

Noise

- 8.8.24 Construction works adjacent to Chobham Common and Bagshott Heath are proposed to take place throughout the year, including the period March to July, which is the nesting season for Dartford warbler, nightjar and woodlark, the species of interest of the SPA. The bird nesting territories at Bagshott Heath are separated from the motorway by a high wooded embankment which will prevent noise and visual disturbance.
- 8.8.25 No embankment exists at Chobham Common, and therefore there is a risk of disturbance due to construction and operational noise. The nearest breeding territories for Dartford warbler were recorded 70m from the motorway, whilst woodlark and nightjar nest over 100m away. Even at 70m away baseline noise levels are relatively high, with typical daytime noise levels (LAeq) of 77 dB.
- 8.8.26 The analysis of construction noise identified that the noise level due to construction at a distance of 70m from the roadside would fall below the existing background levels. In other words it would not be perceptible above the background. It was also found that the total noise level during construction (existing background plus construction noise) would raise overall noise levels at 70m from the roadside during the construction period by less than 3 dB as a worst case.
- 8.8.27 At distances beyond 70m the overall change will be considerably lower than 3 dB. When the small change in background noise levels is considered alongside the temporary nature of the construction works effects are considered to be neutral.

Human Disturbance

- 8.8.28 Consideration has been given to the possible visual impact of works on the M3 during the March to July period. The most disturbance-sensitive species for which the SPA is designated are the nightjar and woodlark.
- 8.8.29 Research⁶ demonstrates that nightjar depend on their cryptic plumage to escape detection, and only flush from (desert) the nest when potential predators are within 50-100m away, although more passive disturbance responses could occur at greater distances. People walking and dogs represent the greatest sources of disturbance.
- 8.8.30 Flushing distances for woodlark were not reported in the same paper but it is likely that they have similar behavioural responses. The nearest nightjar territory recorded in either 2007 or 2012 is approximately 200m from the works area. The nearest woodlark territory is approximately 650m from the works area. It can therefore be concluded that no flushing of the most sensitive species that nest on Chobham Common would occur due to the works. However, monitoring of the nesting locations for sensitive species will be undertaken by an experienced ecologist throughout the bird nesting season so that additional safeguards can be applied to construction activities if necessary.

Lighting

- 8.8.31 Certain construction activities will be undertaken at night time, and will require lighting. Particularly during the nesting season, lighting has the potential to cause disturbance to nesting birds, from minor behavioural changes to nest abandonment. Consideration was therefore given to the impact of the specific type of lighting proposed during construction on the closest potential breeding territories.
- 8.8.32 From 70m away a flashing amber light or high visibility jacket will appear to be specks in the distance, a 2m tall man will appear to be smaller than the width of a thumb held at arm's length while 4m high mechanised plant will appear to be 1.5 times the width of a thumb held at arm's length. At a distance of 70m therefore the construction activity will consist of small moving objects along the line of the motorway. Most disturbance sensitive species do not respond to the presence of vehicles (not recognising them as a threat) but only people or animals such as dogs. Dartford warblers nest in low scrub and appear to tolerate closer human activity than nightjar and woodlark⁷.
- 8.8.33 Given that the construction activities on the shoulder of the M3 will be set against a visual background of constant moving traffic breaking up the image, would be at a constant distance rather than involving movement towards the territories, and would not be associated with the presence of potential predators such as dogs (people with dogs are much more likely to disturb birds at greater distances than people without dogs), it is considered unlikely that flushing of Dartford Warbler would occur at a distance of 70m or more.

⁶ A Review of Disturbance Distances in Selected Bird Species M. Ruddock & D.P. Whitfield. 2007. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage.

⁷ Taylor, K, Anderson, P, Taylor R, Longden K, Fisher P. 2005. English Nature Research Report Number 649: Dogs, access and nature conservation. Report for English Nature. This report states on page 46 that '*The situation with Dartford warbler, the third enigmatic heathland breeding species, is less clear. Liley and Clarke (2003) did not find any correlation between the breeding population and urban influences on Dorset heaths...*'

- 8.8.34 The potential for disturbance from the Scheme will be mitigated by restricting the amount of construction work required within the SPA at Chobham Common and adjacent to the SPA at Bagshot Heath, and locating work compounds away from the SPA. New infrastructure proposed to be installed on the Highways Agency verge at Chobham Common is limited to cabling and some verge hardening. The verge adjacent to Bagshot Heath has two gantries proposed, which will also require associated cabinets and cabling, all works will be within the SRN boundary. All construction works will be undertaken outside the Dartford warbler, nightjar and woodlark nesting season of 1 March to 31 July.
- 8.8.35 Effects due to noise and light during construction on all breeding bird species, including those for which the site is designated as an SPA are considered to be neutral.

Operational Effects

Disturbance due to Increased Noise Levels

- 8.8.36 Noise modelling identifies that in the short term (i.e. on Scheme opening) the operation of the Scheme will result in noise levels being 1 dB higher than would be the case without the Scheme, over a 6ha area of suitable bird nesting habitat at Chobham Common. Three Dartford warbler territories, representing 23% of the Chobham Common population, were recorded in 2012 in this area in 2012. Between Scheme opening and 15 years after Scheme opening, noise levels within this same area are predicted to decrease to pre-Scheme opening levels. Therefore, the increase in noise levels due to operation of the Scheme is both small and temporary.
- 8.8.37 Noise modelling indicates that at Bagshot Heath noise levels will be greater than 2dB, but less than 3dB higher in 2015 as a result of operation of the Scheme than they would without the Scheme. However, this applies only to a narrow strip along the toe of the cutting immediately adjacent to the M3 which is not suitable breeding habitat for SPA birds. No change in noise levels is anticipated beyond the cutting, within the suitable breeding habitat for SPA birds.
- 8.8.38 In general, birds have higher thresholds (are less sensitive) to a specific frequency (pitch) than humans. Therefore a < 2 dB change is unlikely to be perceptible as a difference to Dartford warbler or other birds using the SPA. The effects of noise during operation on breeding birds within the SPA are thus considered to be slight adverse in the short term reducing to neutral following installation of the low noise surface.

Nitrogen Deposition

- 8.8.39 Details of the expected levels of nitrogen deposition arising from the scheme are presented in paragraphs 8.8.12 to 8.8.17. Given that most of the 20m strip adjacent to the M3 in which nitrogen deposition will exceed the 1% threshold is currently managed as a fire break and therefore has little or no nesting value for breeding birds, the effect is considered to be negligible. Furthermore, this strip is already botanically degraded, and has little value as foraging habitat. Effects are thus considered to be negligible.

Increased Mortality of Some Species due to Increased Traffic Volumes and Proximity of Running Lanes to Adjacent Habitat

- 8.8.40 There is a risk that moving live traffic lanes closer to bird habitat in combination with predicted rises in traffic volumes, increases potential for direct mortality of birds which could represent a significant negative impact on breeding bird species using the Thames Basin Heaths SPA.
- 8.8.41 Birds are listed as killed most frequently in most multiple taxa road mortality studies (Forman et al. 2003). Therefore the probability of a fatal collision with a vehicle is likely to increase with increasing traffic volume (Clevenger et al., 2003).
- 8.8.42 However, the nearest SPA bird territories recorded in the most recent season for which data are available (2012) were Dartford warbler territories located over 70m from the highway boundary. Historic records from 2007 do not indicate that Dartford warbler nest closer to the highway boundary than was recorded in 2012. Bird behaviour close to the road is likely to be currently impacted by the presence of the M3 and any birds utilizing the adjacent habitat will be habituated to the motorway. Furthermore, at Chobham Common the fire break on both sides of the M3 also provides a buffer between the M3 and the more favourable habitat that the birds for which the site is designated are most likely to use.
- 8.8.43 For these reasons it is unlikely that the use of the hard shoulder as a running lane would lead to increased mortality of birds from within the SPA. Effects are thus considered to be neutral.

Statutory Designated Sites- South West London Water Bodies SPA

Construction Effects

Temporary and Permanent Land Take

- 8.8.44 The majority of works would take place approximately 350m from the boundary of the SPA/Ramsar at their closest point, and would be shielded by existing vegetation and land forms. The only construction to the east of the M25 is minor works to existing gantries which will require additional cabinets and cabling.
- 8.8.45 The Scheme's footprint along the M3 corridor (carriageway and verge) has neutral potential to support the wintering bird species for which the SPA/Ramsar is designated.
- 8.8.46 The impact of permanent and temporary land take is considered to be neutral and the overall effect neutral.

Noise and Light Pollution

- 8.8.47 Works are currently scheduled to start in May 2014 and continue until December 2016. The detailed phasing of the works has not been determined at this time. Scheme construction will take place throughout winter 2015-2016 when the wintering birds the SPA/Ramsar is designated for will be present. However, other than small-scale cabling and cabinet installation on existing gantries, the works will be over 350m from the SPA and of a scale similar to current maintenance operations. There will therefore be a neutral disturbance effect from construction activities, particularly since the wintering bird populations which are already acclimatised to the existing background noise levels of the M3 and M25. The

impacts of noise and light pollution during construction are considered to be neutral and the overall effect neutral.

Operational Effects

Increased Nitrogen Deposition due to Increased Traffic Emissions

- 8.8.48 Changes in air quality will occur in the immediate vicinity of the motorway and increases in airborne pollutants from car exhausts and construction activities are possible. Effects of these increases would be limited to areas within 200m of the motorway (DMRB, Volume 11, Section 3, Part 1 Air Quality). The APIS website provides details of critical loads of atmospheric pollution which if exceeded would lead to habitat damage. However, no critical levels are provided for the habitat - open standing water that the bird species forming the reason for the designation rely upon to allow for an assessment. Nevertheless, no significant effects are anticipated as the site is located 100m from the Scheme boundary and the potential for direct adverse effects or indirect effects of influencing foraging or commuting behaviour of wintering birds the site is designated for is considered to be neutral.
- 8.8.49 Given the distance between the boundary of the SPA and the motorway (350m) no other potentially significant effects are anticipated.

Statutory Designated Sites- Foxlease and Ancell's Meadows SSSI

Construction Effects

Temporary and Permanent Land Take

- 8.8.50 There will be no temporary or permanent land take from the SSSI. The SSSI is bisected by the motorway at Junction 4a with a small portion of the site lying on the south side of the motorway and the remainder on the north side. The northern portion abuts the motorway, whilst the southern portion extends further east and is separated from the motorway by a minor road. Trees and scrub will be cleared from the verge in order to construct a cross cabling duct. On the southern verge the SSSI is located on adjacent land, separated by the minor road. This may cause some changes in canopy shading on the boundary of the SSSI, with a risk of minor changes to ground flora and increased levels of disturbance. These are known collectively as 'edge effects'. However, the impacts will be temporary and vegetation will re-establish. Therefore the effect is considered to be slight adverse reducing to neutral.

Disturbance and Compaction of Habitats

- 8.8.51 There will be no direct disturbance or compaction of habitats within the SSSI. As for land take there is a risk of 'edge effects' as but these are considered to be negligible since they affect a very small proportion of the site.

Noise and Light Pollution

- 8.8.52 The features for which the site is designated as a SSSI are not considered to be sensitive to noise and light pollution. The site supports a population of marsh fritillary butterfly. However, the motorway is in cutting at this location and therefore the marshland habitats which support the butterfly is likely to be some distance from the highway boundary. Given the proximity of suitable habitat and the low sensitivity of the receptor to the impact the overall effect is considered to be neutral.
- 8.8.53 Given the heathland habitat, the site is likely to support a diverse assemblage of bird species although the bird community is not part of the notifiable interest for the SSSI. Given the proximity of a gantry and MS4 sign (G58B) and a cross cabling duct (50A/B) to the edge of the southern portion of the SSSI, noise and light spillage from the construction works has the potential to cause disturbance to birds. However, noise and light levels from the motorway are already high, and construction activities are anticipated to give rise to minimal additional noise levels at this location. There may be some temporary displacement of birds using the woodland and scrub habitat immediately adjacent to the verge. This is considered to be a minor negative impact. However, taken as a proportion of the entire SSSI, the overall effect is considered to be neutral.

Changes to Drainage and the Hydrological Regime in the vicinity of the Motorway

- 8.8.54 A new cable duct will be excavated within the eastbound verge immediately adjacent to the SSSI. Loss of verge habitat immediately adjacent to the SSSI could give rise to increased levels of soil disturbance and minor changes to drainage patterns on the margins of the SSSI. However, the road is in cutting at this location and therefore the area that will be affected by excavations for the cabling duct is not considered to be hydrologically connected to the neighbouring SSSI.
- 8.8.55 No alterations to the existing drainage arrangements are proposed and given that the road is in cutting at this location, any excess surface water will not be displaced into the SSSI. The impact on the SSSI is thus considered to be neutral and the overall effect is neutral.

Operational Effects

Increased Nitrogen Deposition due to Increased Traffic Emissions

- 8.8.56 NO_x concentrations will increase by more than 1% of the critical level within 60m of the roadside. Therefore nitrogen deposition rates have been calculated. At no point will the rate of nitrogen deposition increase by more than 1% of the critical load (10kg N ha⁻¹ yr⁻¹) for either site due to the scheme. The air quality effect of the scheme will therefore be neutral.
- 8.8.57 Effects are thus considered to be neutral.
- 8.8.58 Increased mortality of some species due to increased traffic volumes and proximity of running lanes to adjacent habitat.
- 8.8.59 There is a risk of increased mortality of birds and other species for which the site is designated as a SSSI due to the loss of the buffering effect of the hard shoulder. This is considered to be a slight adverse effect.

Noise and Light Pollution

- 8.8.60 By 2015 it is predicted that with the Scheme in operation there will generally be a very slight (less than 1dB) decrease in noise compared to 2015 without the Scheme except for a very narrow band along the roadside which will experience a very slight (less than 1 dB) increase in noise. By 2030 it is predicted that there will be a decrease in noise of over 3dB across much of the SSSI compared to 2015, mainly due to the implementation of a low-noise surface by that time. These changes are considered to have a neutral effect on breeding birds within the SSSI.
- 8.8.61 There will be a new gantry and MS4 sign (G58B) on the opposite side of the motorway from the south eastern most portion of the SSSI which will give rise to marginally increased light levels. However, given that light spillage from the signs is considered to be minimal and the road is in cutting at this location, overall effects are considered to be minimal. Effects are considered to be negligible.

Statutory Designated Sites- Chobham Common SSSI

- 8.8.62 The impacts of the Scheme on the dry and wet heathland habitats for which the site is designated as a SAC are assessed in paragraphs 8.8.2 to 8.8.21. Impacts on the bird species for which the site is designated as a SPA (Dartford Warbler, Nightjar and Woodlark) are assessed in Table 8.10. The SSSI designation also includes a number of other habitat types, species and species groups, notably:
- Woodland and scrub;
 - Open water;
 - Bryophytes and lichens;
 - Invertebrates;
 - Bird community including hobby (*Falco subbuteo*).

Construction Effects

Temporary and Permanent Land Take

- 8.8.63 There will be no temporary or permanent loss of woodland and scrub or open water habitats. Although bryophyte communities occur within the short grassland habitat in close proximity, the verge does not support bryophyte communities. Impacts are thus considered to be neutral and overall effects are overall effects are neutral.

Noise and Light Pollution

- 8.8.64 Most of the zone within approximately 30m of the motorway through Chobham Common comprises short acid grassland and is maintained as a firebreak. There is some gorse scrub towards the western end of the section which may provide nesting opportunities for passerine (i.e. perching) bird species.
- 8.8.65 Although baseline noise levels within this zone are high, construction noise, including noise from plant and reversing sirens on vehicles will be audible. There will be lighting of construction activity from temporary lighting columns and flashing beacons on vehicles.

- 8.8.66 Although birds nesting within habitat in the 20m zone may be used to road traffic noise, construction noise, combined with lighting at dawn and dusk during the bird breeding season may lead to a lower number of birds nesting in the remaining scrub habitat within 30m of the road. Beyond this zone, construction noise will be audible but is considered unlikely to result in disturbance. Beyond 70m from the motorway construction noise levels are predicted to fall below existing daytime noise levels.
- 8.8.67 Overall, the increase in noise levels during construction is considered to give rise to a minor adverse effect on breeding birds.

Operational Effects

Increased Nitrogen Deposition due to Increased Traffic Emissions

- 8.8.68 Increases in NO_x and nitrogen deposition are as described for the Thursley, Ash, Pirbright and Chobham Common SAC (paragraphs 8.8.12 to 8.8.18). Air quality calculations indicate that the change in nitrogen deposition rate due to the operation of the scheme will be at or below 0.1 kg N ha⁻¹ yr⁻¹ at all points on the transect, except within 30m of the roadside where it will increase by between 0.12 kg N ha⁻¹ yr⁻¹ (at 30m) and 0.24 kg N ha⁻¹ yr⁻¹ (at 10m). This is equivalent to 1.2 - 2.4% of the critical load.
- 8.8.69 An increase of 2-3% of the critical load would be a minor adverse impact using the thresholds set out in Institute of Air Quality Management and Assessment guidance and the DMRB. Moreover, the area of the SSSI within 20-30m of the M3 at Chobham Common is degraded due to a combination of its encroachment of more scrub-associated and ruderal species and the intensive mowing regime that establishes a firebreak.

Increased Salt Deposition due to Spray from Vehicles

- 8.8.70 With the loss of the hard shoulder spray from vehicles is likely to be carried onto surrounding vegetation rather than remaining on the carriageway. Salt dissolved within vehicle spray has the potential to increase salinity levels in soils within the affected zone, leading to changes in the vegetation composition. Species such as Danish scurvy-grass (*Cochlearia danica*), a non-native, salt tolerant species that is now widely associated with road verges in the UK.
- 8.8.71 The existing verge vegetation within Chobham Common is affected by disturbance and nitrogen deposition from the road. Given that the vegetation community is dominated by vigorous grasses and ruderal species such as bramble, it is considered unlikely that the community will change significantly as a result of any minor increases in salt deposition. Overall, the effect is considered to be slight adverse.

Increased Mortality of Some Species due to Increased Traffic Volumes and Proximity of Running Lanes to Adjacent Habitat

- 8.8.72 There is a risk that moving live traffic lanes closer to bird habitat in combination with predicted rises in traffic volumes, increases potential for direct mortality of birds which could represent a significant negative impact on breeding bird species using the Chobham Common SSSI. Effects are considered for the Thames Basin Heaths SPA (which includes Chobham Common SSSI) in paragraph 8.8.40 to 8.8.43. In summary, the nearest Dartford warbler breeding territories in 2007 and 2012 (one of the species for which it is designated as a SSSI) were greater than 70m away, and the management of the land within 50m of the motorway as a firebreak reduces its value as bird nesting and foraging habitat.
- 8.8.73 The effect is thus considered to be a slight adverse.

Statutory Designated Sites- Colony Bog and Bagshot Heath SSSI

Construction Effects

Temporary and Permanent Land Take

- 8.8.74 There will be no temporary or permanent land take from within the SSSI boundary. The heathland habitat for which the site is designated is separated from the motorway by a steep wooded bank. There will be some loss of vegetation from the bank, but given the habitat is considered to be of low value and the overall effect is neutral.

Changes to Drainage and the Hydrological Regime in the Vicinity of the Motorway

- 8.8.75 A new cable duct will be excavated within the eastbound verge immediately adjacent to the SSSI. Loss of verge habitat immediately adjacent to the SSSI could give rise to increased levels of soil disturbance and minor changes to drainage patterns on the margins of the SSSI. However, the road is in cutting at this location and therefore the area that will be affected by excavations for the cabling duct is not considered to be hydrologically connected to the neighbouring SSSI.
- 8.8.76 No alterations to the existing drainage arrangements are proposed and given that the road is in cutting at this location, any excess surface water will not be displaced into the SSSI. The impact on the SSSI is thus considered to be neutral and the overall effect is neutral.

Noise and Light Pollution

- 8.8.77 Given that the road is in cutting at this point and SSSI habitats are separated from the motorway by steep vegetated bank, levels of noise within the heath as a result of construction activity are not anticipated to increase significantly. The effect is thus considered to be neutral.

Operational Effects

Increased Nitrogen Deposition due to Reduced Air Quality

- 8.8.78 No significant increases in nitrogen deposition are anticipated over 200m from the motorway. Given that the site lies approximately 400m from the motorway, effects are considered to be no more than neutral. No further effects are anticipated.

Non-Statutory Designated Sites

Construction Effects

- 8.8.79 There are nineteen non-statutory sites within the zone of influence (Table 8.3). No land take is anticipated at any of these sites as all works are within the highway boundary.
- 8.8.80 At two sites, Knowle Grove SNCI (ch 3961) and Chobham Common SNCI (Ch 7750 - 8367), there will be construction of ERAs immediately adjacent to the boundary. Woodland habitat within the highway boundary will be lost at these locations giving rise to the risk of increased disturbance and edge effects. Disturbance may lead to some temporary displacement of birds from woodland habitats close to the boundary. These sites are considered to be of medium importance and the impact of disturbance is considered to be minor negative. The overall effect is slight adverse.
- 8.8.81 There will be a gantry structure adjacent to White Hill SNCI (MP 46/8+80-47/6+20B (ch 14175 - 14950)), and two gantries adjacent to Black Hill SNCI (ch 14180 - 14932). Disturbance due to construction at these sites is considered to be neutral and therefore the overall effect is neutral.
- 8.8.82 No ERAs, signs, noise barriers or gantries are proposed adjacent to the remaining nine sites (Trumps Mill SNCI, Lightwater Country Park SNCI, North East of Black Hill SNCI, Tekels Park SNCI, Hawley Meadows SNCI, Meadows North of M3 Junction 4 SINC, Foxlease Meadow 8 SINC and Foxlease Meadows Field 11 SINC). Although there will be MIDAS with associated cabinets and cabling there will be no impacts on neighbouring sites from the construction of these structures. Effects during construction on these remaining sites are thus considered to be neutral.

Operational Effects

- 8.8.83 There are likely to be minor increases in noise levels in the non-statutory sites that border the motorway (Knowle Grove SNCI, Chobham Common SNCI, Black Hill SNCI and White Hill SNCI). Based on noise modelling undertaken for the EAR, any increases resulting from the Scheme will be generally limited to between 0 and 2dB. Such increases are considered to be barely perceptible to the bird and mammal species which are likely to occur within these non-statutory sites. Effects are thus considered to be neutral.
- 8.8.84 At White Hill SNCI the scheme will give rise to noise levels up to 3dB higher than the background levels without the scheme. The zone in which this increase will occur is a narrow strip adjacent to the southern (westbound) carriageway of the motorway and represents less than 5% of the entire site. Elsewhere within this site increases are likely to be less than 1dB, and in some areas there will be a reduction in noise levels.

- 8.8.85 Immediately to the west of Chobham Common (non SSSI) SNCI noise levels as a result of the scheme will increase by above 3dB. However, this increase affects only a very small portion of the site (approximately 1%) close to the motorway, whilst other and more sizeable areas of the site would undergo a reduction in noise levels of 1 to 2dB.
- 8.8.86 Overall, effects on non-statutory sites arising from operational noise are considered to be neutral.
- 8.8.87 There was considered to be a potential for increases in the levels of nitrogen deposition at non statutory sites close to the Scheme and therefore air quality modelling has been undertaken.
- 8.8.88 At Knowle Grove, White Hill and Chobham Common (non-SSSI) SNCI's NO_x concentrations will increase by more than 1% of the critical level within 200m of the roadside due to the scheme. Therefore nitrogen deposition rates have been calculated. Nitrogen deposition will increase by 1% of the critical load (10kg N ha⁻¹ yr⁻¹) or less except within 20m of the roadside (30m in the case of Chobham Common). Even within this zone the change is small (considerably less than 5% of the critical load, which is the DMRB definition of a small change). Total nitrogen deposition rates within this zone will increase by up to 0.21kg N ha⁻¹ yr⁻¹, or less than 1% of the 2015 baseline, as a result of the scheme. A subtle change in the botanical composition within a 20m strip (30m in the case of Chobham Common) along the roadside may therefore occur, but an effect is not certain since existing site-specific factors such as management and drainage could ultimately prevent any detectable botanical effect from arising. This is considered to be slight adverse at most and not significant.
- 8.8.89 At Trumps Mill SNC, Hawley Meadows SINC and Bramshott Copse SINC increases in NO_x concentrations and nitrogen deposition rates are considered to be less than 1% of the critical level or relevant critical load (10kg N ha⁻¹ yr⁻¹ for Trumps Mill and Bramshott Copse, 20kg N ha⁻¹ yr⁻¹ for Hawley Meadows). The air quality effect of the scheme will therefore be neutral for these sites.
- 8.8.90 At Lightwater Country Park SNCI and Black Hill SNCI NO_x concentrations will increase by more than 1% of the critical level within 200m of the roadside due to the scheme, therefore nitrogen deposition rates have been calculated. At no point along the transect will the rate of nitrogen deposition increase by more than 1% of the critical load (10kg N ha⁻¹ yr⁻¹). The air quality effect of the Scheme will therefore be neutral.
- 8.8.91 At Tekels Park SNCI NO_x concentrations will increase by more than 1% of the critical level within 40m of the roadside, therefore nitrogen deposition rates have been calculated. At no point will the rate of nitrogen deposition increase by more than 1% of the critical load (10kg N ha⁻¹ yr⁻¹) for either site due to the Scheme. The air quality effect of the scheme will therefore be neutral.

UK Priority Habitats- Woodland

Construction Effects

- 8.8.92 Woodland habitat occurs within the highway verge at twenty locations (Table 8.6). At nine of these locations there are non-statutory sites designated for woodland habitats on adjacent land. At two of these nine locations, Knowle Wood (ch 3970 - ch 4825) and woodland at the western end of Chobham Common (ch 7960 - ch 8475) construction of ERAs will lead to a minor loss of UK BAP woodland and potential temporary disturbance of adjacent habitat.
- 8.8.93 Temporary loss of woodland habitat will occur within the working footprint required to construct permanent infrastructure. There will be a total temporary loss of 3.71ha of woodland habitat. Woodland habitats to be lost include mixed plantation, mixed semi natural woodland, semi natural broadleaved woodland and plantation broadleaved woodland. The extent of loss from each of these woodland types is presented in Table 8.10.

Table 8.10: Total Temporary Land Take from Woodland Habitats

Habitat type	Number of woodland areas to be impacted upon	Total habitat loss (ha)
Mixed plantation woodland	5	0.971ha
Mixed semi-natural woodland	6	0.36
Semi natural broadleaved woodland	9	1
Broadleaved plantation woodland	9	1.26

- 8.8.94 The proposed gantry laydown area and construction compound at MP 36/8 to 37/2 (ch 4200-4600) may result in the loss of broadleaved woodland habitat, dominated by silver birch (*Betula pendula*). The layout of the site will aim to minimise woodland habitat loss.
- 8.8.95 There will be replacement planting where trees will be lost as a result of the temporary works. The approach to replacement planting will be to use species characteristic of the habitats currently present, whilst avoiding non-native species (such as sycamore (*Acer pseudoplatanus*)) and disease prone species (such as ash (*Fraxinus excelsior*)). Whilst this does not represent replacement of ancient woodland habitat it will ensure that the appropriate species assemblages are maintained on the margins of the ancient woodland habitats which lie beyond the SRN boundary.
- 8.8.96 Effects on UK BAP woodland habitats are considered to be slight adverse.

Operational Effects

- 8.8.97 Operational effects on woodland habitats are considered to be neutral.

UK Priority Habitats-Heathland, Grassland and Floodplain Grazing Marsh

Construction Effects

- 8.8.98 UK BAP Habitats also occur adjacent to the Strategic Road Network boundary or within 50m at 13 locations covering lowland heathland, grassland and floodplain grazing marsh. There is potential for localised changes to drainage patterns close to the boundary as soil is exposed during excavation of trenches and sign foundations. However, the period of construction at individual sites will be relatively short, and trenches and foundations will be backfilled on completion. The potential for permanent changes to drainage is considered limited. Overall, the effect is considered to be slight.
- 8.8.99 Temporary land take will occur from grassland habitat within the working area around permanent infrastructure. There will be a total loss of 4.43 ha (4,300m²) of grassland.
- 8.8.100 Effects on lowland heathland, grassland and floodplain grazing marsh habitats on or adjacent to the Highways Agency verge has been assessed as slight adverse.
- 8.8.101 All other UK BAP habitats are at least 50m from the Scheme and are not anticipated to be impacted by the Scheme. Likely impact magnitude/significance of the effects of the proposals on these sites has been assessed as neutral.

Operational Effects

- 8.8.102 Of the other UK BAP habitats bordering the road only heathland habitats are considered to be sensitive to increased nitrogen deposition associated with increased traffic emissions. In most cases heathland habitat lies within statutory or non-statutory sites for which air quality effects are assessed above. Changes in nitrogen deposition rates in those undesignated heathland habitats adjoining the motorway are likely to be similar to sites such as Chobham Common SSSI, i.e. within 1 to 2% of the critical load and will therefore result in no more than a slight adverse effect.
- 8.8.103 Increases in surface water runoff and water logging due to the proximity of traffic to neighbouring habitat is unlikely to affect UK BAP habitat. Minor effects may occur as a result of salt deposition.

UK Priority Habitats Classified Waters

Construction Effects

- 8.8.104 Cove Brook (ch 20425 and ch 20390) is within 30m of a proposed new gantry (ch 20455). There would be A and B chambers within 10m of the Bourne Brook crossing, although the chambers would be within the verge and would not affect riparian habitat. Windle Brook and Clappers Brook lie within 20 to 50m of new structure locations. Given the CEMP measures outlined in Table 8.9 the risk of pollution of the brook is considered to be low. The effect on watercourses is considered to be neutral.

Operational Effects

- 8.8.105 Existing filter drains will continue to attenuate most surface water run off whilst new drainage will attenuate increased run off at ERAs. Pollution control measures will also be provided at ERAs. There should be no increased risk of contaminated run off entering the various watercourses crossing the route as a result of the Scheme. The effect is considered to be neutral.

UK Priority Habitats On-site Habitats

Construction Effects

- 8.8.106 Other habitats present on the Highways Agency verge are not thought to be of sufficient nature conservation value to give rise to significant effects. Nevertheless the proposed Scheme will involve the permanent loss and temporary disturbance to species-poor semi-improved grassland, broadleaved plantation woodland, immature broadleaved woodland, immature scattered trees, ephemeral/short perennial, tall ruderals and scattered bracken habitats. Given the low importance of these habitats the effect is considered to be neutral.

Operational Effects

- 8.8.107 Operational effects on site habitats are considered to be neutral.

Protected Species

- 8.8.108 Table 8.11 shows potential effects on protected species and their significance with mitigation described in Section 8.6 in place.

Species	Effect characterisation	Significance
Bats	<p>Construction effects Potential for severance of habitat used by commuting bats, particularly adjacent to watercourses, notably Cove Brook where 5 species of bat have been recorded. This is likely to have a minor effect on bats as habitats generally extend onto the Highways Agency verge from offsite and are unlikely to be completely severed. There is potential that flood lighting during nights works (if required) could disturb or prevent bats using regular commuting routes or foraging areas. This could potentially sever habitats for bats.</p> <p>Operational effects Increased lighting from messaging signs could affect bat foraging pattern. Bat activity was found to be highest at watercourse crossings, notably the Cove Brook (MP 53/1+20A (ch 20425), MP 53/0+80B (ch 20390) and Blackwater River. There will be a gantry within 30m of the Cove Brook, which could lead to a marginal increase in lighting levels within the brook corridor. However, light spillage from the messaging signs is very localised and this is not considered likely to affect bat foraging behaviour.</p>	Neutral Neutral
Great Crested Newt	<p>Construction effects 300m of Highways Agency verge (MP 36/9 (ch 4225) – 37/2A (ch 4525)) is within 250m of 3 ponds supporting GCN. The Highways Agency verge is ~0.5m with minimal vegetation cover and is degraded. No new structures are being installed in this section, so construction will be limited to MIDAS with associated cabinets and cabling if required. There is suitable foraging and sheltering terrestrial habitat adjacent to the verge. However, since only small populations of GCN were recorded in the three ponds during surveys in 2013 it is reasonable to assume that they will preferentially use suitable terrestrial foraging habitat closer to the breeding pond. Two of the ponds (7a and 7b) are separated from the Highways Agency verge by a race track which also represents a partial physical barrier. The risk that GCN will suffer killing or injury as a result of construction activity confined to the Highways Agency verge is considered to be neutral and therefore the effect is neutral.</p> <p>However, potential location of the construction laydown area in vicinity of the ponds would increase potential to kill or injure individual newts during construction. A GCN licence would be required to ensure GCN are excluded from the potential lay down area thus avoiding injury or killing.</p> <p>Operational effects No operational effects are considered likely since suitable terrestrial foraging habitat occurs between the breeding ponds and the Highways Agency verge.</p>	Neutral None

Species	Effect characterisation	Significance
Breeding Birds	<p>Construction effects Assuming vegetation clearance will take place outside the bird nesting season, risk of disturbance to nesting birds is minimal. Permanent loss of nesting habitat (woodland and scrub) due to construction of the Scheme will occur. This is likely to represent a relatively minor effect as extensive and less disturbed nesting habitat is available on adjacent land.</p> <p>Operational effects There is a risk of increased mortality of birds due to the proximity of traffic to neighbouring woodland and scrub habitat within the verge. This is considered to be a slight adverse effect.</p>	Slight Adverse Slight Adverse
Badgers	<p>Construction effects During construction there is potential for damage or destruction of badger setts and for animals to be killed or injured, whilst in setts and away from their setts at night. However, setts within the physical footprint of the works will be closed under licence from Natural England prior to the commencement of construction. Setts that lie within the vicinity but are not within the physical footprint of the works will be protected through the use of temporary fencing to ensure there is no damage or disturbance as a result of construction activity.</p> <p>There is also potential for permanent and temporary loss of suitable foraging habitat. This is likely to represent a minor effect as extensive suitable habitat is available on adjacent land, and the majority of works will be close to the hard shoulder which is generally low quality and degraded and therefore has poor suitability for foraging badgers.</p> <p>Operational effects There is a risk of increased mortality of badgers due to the proximity of traffic to neighbouring woodland and scrub habitat within the verge. This is considered to be a slight adverse effect.</p>	Neutral Slight Adverse
Widespread reptiles	<p>Construction effects Watching briefs will be maintained in areas of known reptile habitat. There is also potential for permanent and temporary loss of reptile habitat. These are likely to represent relatively minor effects as extensive suitable habitat is available on adjacent land, and the majority of works will be close to the hard shoulder which is generally low quality and degraded and therefore has poor suitability for reptiles.</p> <p>Operational effects There is a risk of increased mortality of reptiles due to the proximity of traffic to neighbouring woodland and scrub habitat within the verge. This is considered to be a slight adverse effect.</p>	Slight Adverse Slight Adverse

Species	Effect characterisation	Significance
Otter	<p>Construction effects A new gantry is proposed within 30m of Cove Brook and there will be chambers in close proximity to the Bourne which may affect riparian habitat. Noise disturbance during construction is not considered to be significantly higher than existing levels. Disturbance due to human activity will be higher, particularly in the vicinity of Bourne Brook. However, work will take place over a short period, and given the relatively poor quality of the habitat for otter, and the absence of records of the species on these watercourses this is considered to be neutral.</p> <p>Operational effects There is a minor risk of increased mortality of otter due to the proximity of traffic to watercourses and neighbouring riparian habitat, particularly on the Blackwater River where the species has been recorded in the past. This is considered to be a slight adverse effect.</p>	<p>Neutral</p> <p>Slight Adverse</p>
Water vole	<p>Construction effects Construction of the gantry close to Cove Brook will not affect riparian habitat and therefore no effects on water vole are anticipated. Construction close to watercourses has potential to disturb water voles if present.</p> <p>Operational effects No operational effects are anticipated on water vole.</p>	<p>Neutral</p> <p>Neutral</p>
Other species: Hedgehogs	<p>Construction effects During construction there is potential for individual animals to be killed or injured on roadside verges. There is also potential for permanent and temporary loss of hedgehog habitat. These are likely to represent relatively minor effects as extensive suitable habitat is available on adjacent land, and the majority of works will be close to the hard shoulder which is generally low quality and degraded and therefore has poor suitability for hedgehogs.</p> <p>Operational effects There is a risk of increased mortality of other species due to the proximity of traffic to neighbouring woodland and scrub habitat within the verge. However, impacts are considered likely to be neutral, hence this is considered to be a neutral effect.</p>	<p>Neutral</p> <p>Neutral</p>

8.9 Mitigation Measures

- 8.9.1 Post construction, planting should aim to enhance the ecological value of the Highways Agency soft estate in the vicinity of the proposed Scheme. Consideration should be given to the inclusion of locally sourced native plant species within planting proposals and the application of sensitive management and monitoring regimes.
- 8.9.2 Slight adverse effects during operation include increased mortality rates of otter (associated with the Blackwater River only) breeding birds, badgers and reptiles. Otter mortality (along Blackwater River) will be monitored, and mitigation measures considered if increased levels or mortality are detected.
- 8.9.3 Monitoring of nesting locations for sensitive birds species, including Dartford warbler and nightjar, will be undertaken during the bird breeding season and additional safeguards applied to construction activities if necessary.
- 8.9.4 A landscape and ecological mitigation strategy will be implemented to re-instate on-site habitats and ensure that the sites overall integrity and conservation objectives are maintained. This includes planting with appropriate species compositions.
- 8.9.5 Effects on all other ecological receptors are considered to be neutral.

8.10 Significant Effects (including Cumulative)

- 8.10.1 Overall, effects arising from construction of the Scheme are considered to be slight adverse due to potential disturbance and hydrological effects on BAP habitats and species on land immediately adjacent to the boundary. Effects during operation are considered to be slight adverse due to the increased mortality risk for mammals and reptiles.

8.11 Limitations of Assessment

- 8.11.1 This assessment is based on up to date desk study information and targeted field surveys. The targeted field surveys focused on the areas where signs, gantries, ERAs and cabling works were proposed prior to completion of detailed design. Whilst subject to potential change, these are considered to represent a sufficiently robust baseline on which to base the assessment.

8.12 Summary

- 8.12.1 An assessment of impacts on biodiversity receptors has been undertaken based on desk study and field survey data. The assessment is in accordance with the DMRB Vol. 11 methodology, and takes account of relevant nature conservation legislation policy and guidance. Effects on statutory and non-statutory sites, UK BAP habitats and protected and notable species have been assessed.
- 8.12.2 The proposal is for an 'All Lane Running Scheme' which utilises the hard shoulder as a running lane at all times. The Scheme makes use of a number of traffic management measures including signs, ERAs, Motorway Incident Detection and Automatic Signalling (MIDAS), and SOS telephones. New technology infrastructure including new cabling ducts is required to implement these measures.

- 8.12.3 The design ensures that there will be no encroachment beyond the highways boundary fence in order to limit the impacts of the Scheme on sensitive neighbouring habitats. New infrastructure through Chobham Common SSSI, SAC and SPA has been minimised in order to limit impacts on verge and adjoining habitats. Impacts during the construction stage of the project will be controlled through a CEMP.
- 8.12.4 Overall slight adverse effects are anticipated with proposed mitigation measures in place.

8.13 References

Design Manual for Roads and Bridges, Volume 11, Section 3, Part 3 Air Quality – Procedure for Assessing Impacts.

Harris, S., Cresswell, P. & Jefferies, D., 1989, Surveying for badgers, Occasional Publication of the Mammal Society No. 9. Mammal Society, Bristol.

Highways Agency, 2012, Interim Advice Note 174/12 Updated advice for evaluating local air quality effects for users of DMRB Volume 11. Section 3, Part 1 Air Quality (HA207/07).

Highways Agency & URS, 2013, M3MM J2 to 4a Scheme, PCF 116 Assessment of the Implications on European Sites Natura 2000 Sites (SGAR2).

MAGIC website, an interactive mapping website providing geographic (rural, urban, coastal and marine) information about the natural environment from across government, managed by Natural England, available at: <http://magic.defra.gov.uk/>.

Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M., (2000), Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*), Herpetological Journal 10(4), 143-155.

9. MATERIALS

9.1 Introduction

- 9.1.1 This chapter assesses the impact of the M3 Junction 2 to 4A on material assets.
- 9.1.2 This chapter has been compiled following guidance provided in Highways Agency Interim Advice Note 153/11 Guidance on the Environmental Assessment of Material Resources. This guidance covers the impact of road schemes on material resources and waste arisings.

9.2 Regulatory/Policy Framework

National Legislation and Policy

- 9.2.1 Since the Site Waste Management Plans Regulations 2008 were revoked by the Environmental Noise, Site Waste Management Plans and Spreadable Fats, etc. (Revocations and Amendments) Regulations 2013, Site Waste Management Plans (SWMP) are no longer a legal requirement of major development. Nevertheless many principles behind the regulations remain good practice and are therefore recommended.
- 9.2.2 In relation to construction, demolition and excavation (CD&E) waste, The Waste Strategy for England (2007) states that there is a good potential to increase resource efficiency in construction and reduce waste. Evidence suggests that contractors tend to underestimate the true cost of waste, neglecting the lost value of materials in skips. The re-use and recycling of CD&E waste suitable for reprocessing into aggregates (particularly demolition and earthworks) has increased. Rates of landfilling for site construction waste still appear high and there is scope for improved performance. To stimulate diversion from landfill, the government proposed a possible new target of halving the amount of CD&E waste going to landfill by 2012 as a result of waste reduction, re-use and recycling. The last published report, (Strategic forum for Construction & WRAP, 2012) reported the 2010 results and indicated that this target could be met with a 28% decrease in CD& E waste going to landfill compared with 2008.
- 9.2.3 The Environmental Protection Act (1990) requires that all producers of controlled waste ensure that they only transfer wastes that they produce to authorised carriers or to operators with suitable permits for the management of these wastes. Part IIA of the Environmental Protection Act requires a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment.
- 9.2.4 Planning policy at the National Level is set by the National Planning Policy Framework. Paragraph 120 advises that where a site is affected by contamination or stability issues, it is the responsibility of the developer or landowner to secure a safe development. Further to this, paragraph 121 advises that planning policies and decisions should ensure that:

'The site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation; after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and adequate site investigation information, prepared by a competent person is presented.'

Local/Regional Policy

- 9.2.5 Local planning policies relating to waste were previously directed under the South East Plan. The published Localism Act which was implemented in 2012 provides for the abolition of Regional Spatial Strategies, including the South East Plan. The South East Plan was revoked in March 2013. Development plans across the former South East government office region now comprise local plans, and where they exist, neighbourhood plans.
- 9.2.6 Local planning policies relevant to waste management are also directed by the National Planning Policy Framework (NPPF), introduced in March 2012. Local Authorities have yet to update and publish their relevant local level guidance in accordance with the NPPF.
- 9.2.7 The majority of the Scheme lies within the Surrey County boundary. Current guidance in relation to waste and minerals planning is contained in the Surrey Waste Plan (2008) and the Surrey Minerals Plan (2011), which forms the Development Plan for Surrey. In particular, the purpose of the Surrey Waste Plan is to set out a clear statement of waste planning policies that will provide a framework for the consideration of planning applications for the development of waste management facilities or other forms of development with significant waste implications.

9.3 Study Area

- 9.3.1 The study area of this assessment is identified specifically as the land within the highway boundary of the M3 between Junctions 2 to 4a. However, waste disposal is considered more generally in the M3 corridor within Surrey, with regard to waste management facility proximity and ability of the nearest facilities to accept waste types specific to the M3 proposals.

9.4 Baseline Conditions and Value of Resources

- 9.4.1 The DMRB Material Resources guidance provided in IAN153/11 requires that this assessment builds on the findings and recommendations of the Materials EIA Scoping Assessment. The M3 Junction 2 to 4a Environmental Scoping Report 'scoped in' Materials on the basis of anticipated waste generation resulting from:
- The transportation of materials to and from site (import and export);
 - The storage of materials on site;
 - Decommissioning of existing infrastructure e.g. gantries, cabinets, etc.;
 - Excavation of materials at major infrastructure locations; and
 - Disposal of surplus or hazardous materials.

- 9.4.2 The M3 J2 to 4a Smart Motorway project will be constructed within the existing highway boundary. It is anticipated that material use and waste generation due to implementation of the Scheme will be relatively minor in relation to the value of the project and emphasis has been placed on the re-use and recycling of materials within the design.
- 9.4.3 Specifically the 'simple assessment' methodology refers to the assessment of:
- The materials required for the project and, where information is available, the quantities.
 - The anticipated waste arisings from the project, and where information is available, the quantities and type (e.g. hazardous).
 - The impacts that may arise in relation to materials and waste.
 - A conclusion about whether this level of assessment is sufficient to understand the effects of the project or whether Detailed Assessment is necessary.
- 9.4.4 The South East of England suffers from a significant gap in disposal capacity, and where possible measures for reuse (either on-site or off-site) must be considered during the design phase. Particular attention must be paid to the generation of materials, as this offers the largest opportunity to consider ways that waste can be reduced and site-gained materials can be reused or recycled as part of the project.
- 9.4.5 The closest inert waste landfill site identified from the Surrey Waste Plan is Land at Coldharbour Lane, Thorpe which is located approximately 1km east of the M3 Junction 2.
- 9.4.6 Given that the proposals lie within the existing highways boundary, any contaminated material is likely to have arisen from highway-related activities and would therefore only be anticipated to result in small quantities of hazardous waste.
- 9.4.7 The closest non-inert waste landfill site identified from the Surrey Waste Plan is Princess Royal Sandpit (Runfold South Quarry), Guildford Road, Runfold, which is located approximately 10km south of the M3 Junction 4A. In addition, reference to the Environment Agency website indicates the presence of a number of historic landfills in close proximity to the motorway. These vary in size and, where types of waste are recorded, the majority appear to have been used for disposal of household and commercial waste. A couple of former landfills, the Trumps Farm Landfill at Virginia Water, approximate ch 3750-4500, and Trumps Mill Lane landfill, north of the motorway at approximate ch 2450-2750, are recorded as having potentially received hazardous waste.

9.5 Mitigation and Detailed Scheme Development

- 9.5.1 This assessment considers the use of existing site materials (e.g. concrete from demolition of existing structures, excavation of material from earthworks), and materials brought on to site but not used for the original purpose (e.g. damages, off cuts, surplus). Recommendations are made for the sustainable use of materials and disposal of waste in accordance with the waste hierarchy are made below (i.e. first prevention, then reuse, recycle, recovery and last disposal). Reference is made to the requirements under the Waste (England and Wales) Regulations 2011.

9.5.2 As stated above, SWMPs are no longer a legal requirement of major development. Nevertheless a SWMP is recommended as good practice. This is recommended in addition to a Construction Environmental Management Plan (CEMP). These documents will be live documents which will track materials and waste with the aim of reducing to a minimum any potential environmental impacts and effects) and ensure compliance with legislation. The Contractor will populate these documents with detailed information once the Scheme has progressed to the detailed design stage.

9.5.3 A summary of anticipated mitigation measures is presented in the Table 9.1 below.

Table 9.1: Anticipated Mitigation Measures

Project Activity	Potential impacts associated with material resource use/waste management	Description of mitigation measures	How the measures will be implemented, measured and monitored
Site remediation/ preparation/ earthworks	Impacts associated with the transportation of materials and unnecessary imports of primary aggregates and/or fill material.	Primary materials will be sourced locally wherever possible. Excavated material will be re-used on site where possible. Materials and waste will be transported by road, using the existing highway network.	Mitigation measures will be implemented by a site specific CEMP and SWMP. Opportunities for reduction, reuse and recycling will be identified.
Demolition and construction	Impacts associated with the transportation of construction material and the disposal of waste associated with the removal of existing material.	Primary materials will be sourced locally where possible. Excavated material will be re-used on site where possible. Materials and waste will be transported by road, using the existing highway network.	Mitigation measures will be implemented by a site specific CEMP and SWMP. Opportunities for reduction, reuse and recycling will be identified.
Operation and maintenance	Impacts associated with the annual maintenance regime.	Maintenance will be carried out in accordance with a planned annual schedule (likely to involve overnight closure of the motorway). This will reduce the impact by limiting ad-hoc visits by maintenance contractors.	Scheduled maintenance regimes will form part of the contract for ongoing maintenance and will ensure efficient use of resources.

9.6 Magnitude of Impacts

Construction and Operation

9.6.1 A summary of the expected materials and waste streams associated with the construction of the Scheme are provided in Table 9.2 and Table 9.3 below.

Table 9.2: Material Resources

Project Activity	Material resources required for the project	Quantities of material resources required	Additional information on material resources
Site remediation/preparation/earthworks	Primary aggregate for widening of embankments for gantry and Emergency Refuge Area (ERA) construction.	There would be a net gain of arisings available (see Table 9.3 below), and so material would be available for small quantities of fill required if suitable. However, given that this is unlikely to be reusable, material aggregate would need to be sourced (approximately 2300 m ³ granular fill required from off-site), the timing of which would be managed through the SWMP to keep import of material onto the site to a minimum. Consideration should be given to the use of locally sourced recycled materials or the potential coordination of materials available from other nearby schemes to provide any required fill.	Primary materials will be sourced locally where possible. Materials will be transported by road, using the existing highway network. Excavated material will be re-used on site wherever possible. Recycled material will be used wherever possible.
Demolition and construction	Material use is not expected to be significant during the anticipated minor demolition works. The installation of new technology and infrastructure would require material use including: - Piling for gantry foundations and retaining walls: Steel reinforcement and concrete. - Sheet Piling for retaining walls: Steel. - Gantry foundations: concrete and reinforcement. - Gantry superstructures: Steel.	Number of Proposed Gantries: 55 Area of Gantry Foundations (m ³): 513 Number of Proposed ERAs: 12 Area of new Pavement (m ²): 312,308 Length of new Drainage (m): 40,000 Number of new Chambers at ERAs: 48 Length of new Steel Safety Barrier (m): 30,000 Length of CSB (m): 21,000 Length of Retaining Walls (m): 2,400 Locations which Require Pier Strengthening: 6 Total number of Lighting Columns Re-erected: 58	Primary materials will be sourced locally where possible. Materials will be transported by road, using the existing highway network, but avoiding minor roads where possible.

Project Activity	Material resources required for the project	Quantities of material resources required	Additional information on material resources
	<ul style="list-style-type: none"> - Central reserve vertical concrete barrier concrete and reinforcement. - Pier protection at over bridges: concrete and reinforcement. - Pavement resurfacing strengthening and widening within central reserve - Bituminous and granular materials. - Vehicle protection barriers: concrete and steel. - Drainage: steel, concrete, granular material, GRP. <p>Existing gantries are re-used where possible.</p> <p>Technology Equipment: steel cabinets, steel and GRP ducting. Electronic equipment.</p>		
Operation and maintenance	Routine maintenance of infrastructure and technology including surfacing asphalt and servicing of electronic equipment.	Insignificant quantities (not estimated).	Primary materials would be sourced locally where possible. Materials will be transported by road, using the existing highway network.

Table 9.3: Waste Arisings

Project Activity	Waste arisings from the project	Quantities of waste arisings (estimated) ¹	Additional information on waste arisings
Site remediation/ preparation/ earthworks	Minimal waste arisings are anticipated which would be managed as part of a SWMP and disposed of in accordance with statutory requirements.	Approximately 9000 m ³ Unsuitable material for reuse requiring disposal	Waste will be minimised as far as possible through re-use on site, although this is unlikely to be possible, as existing fill material is understood to be unsuitable for re-use. One inert waste landfill site has been identified locally (refer to Paragraph 9.4.5 above).
Demolition and construction	<p>Existing infrastructure (e.g. gantries, drainage) may be re-aligned, including:</p> <ul style="list-style-type: none"> - Carriageway planings from resurfacing of the existing hard shoulder carriageway. - Replacement of trenched cables with ducting. - New construction: Small quantities of spoil from piling, timber shuttering. - Existing steel safety barriers; and central reserve fill material from replacement with concrete barriers. - Some waste materials may contain asbestos. <p>The installation of new technology and infrastructure will result in waste arisings including:</p> <ul style="list-style-type: none"> - Spoil from piling, timber shuttering. 	There would be a net gain of arisings available (see above), and so material would potentially be available for the small quantities of fill required. However given that this is unlikely to be reusable material, aggregate would need to be sourced, the timing of which would be managed through the SWMP to keep import of material onto the site to a minimum. Import of all other materials to site required cannot be avoided.	<p>The removal and disposal of any small quantities of asbestos would be managed through the SWMP and in line with legislative requirements. Due to the relatively small amounts of asbestos expected to be present (if any) and the implementation of the SWMP, significant impacts or effects are unlikely.</p> <p>The Scheme will require the removal and disposal of some materials (such as that excavated for foundations) that are considered to be Construction and Demolition (C & D) waste, and therefore require disposal to inert landfill. Materials will be transported by road, using the existing highway network.</p> <p>Where given, the proposals for development within the existing highways boundary, a small amount of highway-related contamination may be anticipated to result in small quantities of hazardous arisings.</p>

Project Activity	Waste arisings from the project	Quantities of waste arisings (estimated) ¹	Additional information on waste arisings
	<ul style="list-style-type: none"> - Packaging material related to new infrastructure. - Material excavated for gantry foundations and cutting. 		<p>Contaminated materials would be subject to waste acceptance criteria testing and would require disposal at an appropriately licensed facility (Princess Royal Sandpit Landfill site – refer to paragraph 9.4.7). Such contaminated material would be transported by road, using the existing highway network.</p>
Operation and maintenance	Waste arisings during operation and maintenance are expected to be minimal.	Insignificant quantities (not estimated)	Any waste arisings will be produced during periodic maintenance and are not expected to be significant.

¹ Quantities estimated prior to completion of detailed design and therefore may be subject to change.

9.7 Significant Effects

Construction and Operation

- 9.7.1 Due to the inherent efficiency of implementing smart motorways schemes, only a relatively small amount of materials will be used and waste produced. Mitigation measures have been identified and will be developed and finalised at the detailed design stage. No significant impacts or effects are anticipated in respect of materials based on current proposals. Therefore no detailed assessment is required. Identification of specific waste streams and construction impacts will be considered further in the SWMP at the construction stage.
- 9.7.2 The potential for the Scheme to impact on historic landfill sites, located mainly to the west of Junction 2, was scoped out of the EAR at the scoping stage. Reference was made to the potential of landfills to impact on surface water, groundwater and abstractions in the surrounding area, including those underlying or within close proximity of the proposed works. A risk of this affecting the Scheme proposals was also identified in the Preliminary Sources Study Report (Highways Agency, 2012). Should land contamination be identified on site at the construction stage, this would be managed through the SWMP, and would require disposal as hazardous material at an appropriately licensed facility (the nearest being the Princess Royal Sandpit Landfill – refer to paragraph 9.4.7).

9.8 Limitations of Assessment

9.8.1 The DMRB Material Resources guidance states that it is not possible to provide detailed guidance on some aspects of the assessment process, namely significance of effect, that the DMRB Volume 11 guidance would normally be expected to be covered. It recognises that permanent impacts are likely to be significant in terms of their effect and so projects should as a minimum aim to identify these. Similarly estimates of quantities of materials to be used and waste forecast to be produced can be made and provides the basis for assessment of magnitude of change.

9.8.2 Cut and fill volumes have been estimated based on the design information available at the time of writing and are therefore likely to change as detailed design evolves. The estimated volumes are intended only for the purpose of the current assessment. However, it is not predicted that any changes would be substantial and therefore would not affect the outcome of this assessment. The SWMP would be produced by the Scheme's Contractor as a working document, and would therefore take account of changes in Scheme design and be based on construction operations as they occur.

9.9 Summary

9.9.1 No significant residual environmental effects associated with material resource use and waste generation are envisaged as a result of the proposals for the M3 Junction 2 to 4a Smart Motorway Scheme. It is therefore considered not necessary that a detailed assessment be undertaken of materials. A SWMP would be produced by the Contractor as good practice.

9.10 References

Highways Agency, 2012, M3MM J2 to 4a Scheme, Preliminary Sources Study Report (SGAR2). Report No. HAGDMS No 26699.

Strategic Forum for Construction & WRAP, G Hobbs, July 2012, CD & E Waste: Halving Construction, Demolition and excavation waste to landfill by 2012 compared to 2008, and July 2012, The 2010 Assessment for CD & E Waste to landfill in England.

10. NOISE AND VIBRATION

10.1 Introduction

10.1.1 This report details the predicted noise and vibration impacts of the proposed Smart Motorway Scheme on the M3 between Junction 2 and Junction 4a. The Scheme would potentially affect traffic noise and vibration levels as experienced by sensitive receptors such as residential properties in the vicinity of the Scheme, as well as sensitive receptors along any other surrounding affected roads.

10.1.2 The operational traffic noise and vibration assessment has been undertaken following the methodology as described in the current version of the Design Manual for Roads and Bridges (DMRB) Vol. 11, Section 3, Part 7, HD 213/11 Revision 1 (DMRB, 2011). The assessment considers both changes in absolute noise levels and the effect on residents in terms of annoyance.

10.1.3 The assessment considers the following traffic scenarios for which traffic data were provided:

- 2009 current baseline conditions;
- 2015 baseline year of opening Do-Minimum (2015DM), without the Scheme;
- 2015 baseline year of opening Do-Something (2015DS), with the Scheme;
- 2030 future assessment year 15 years after opening Do-Minimum (2030DM), without the Scheme; and
- 2030 future assessment year 15 years after opening Do-Something (2030DS), with the Scheme.

10.1.4 Temporary noise and vibration impacts arising from the construction works associated with the Scheme are also discussed. Only limited information on the activities, plant and programme is currently available and therefore a detailed quantitative construction noise assessment has not been possible at this stage. Historical data for vibration levels associated with the likely type of piling proposed to install new gantry foundations and emergency refuge areas (ERAs) are used to assess the potential for significant construction vibration effects.

10.2 Regulatory/Policy Framework

The Land Compensation Act 1973

10.2.1 Part I of the Land Compensation Act 1973 includes provision for compensation for loss in property value resulting from physical agents including noise. Part II includes provision for noise mitigation measures at dwellings adjacent to new or altered highways if certain conditions are satisfied.

The Noise Insulation Regulations 1975 as Amended 1988

10.2.2 Under the conditions specified in The Noise Insulation Regulations (NIR) 1975 (as amended in 1988) residential properties may qualify for an offer of noise insulation if all four of the following conditions are satisfied:

1. The property must be within 300m of the nearest point of the new or altered carriageway;

2. The combined expected maximum traffic noise level, i.e. the relevant noise level, from the new or altered highway together with other traffic in the vicinity must not be less than the specified noise level, 68 dB $L_{A10,18h}$;
3. The relevant noise level is at least 1.0 dB(A) more than the prevailing noise level, i.e. the total traffic noise level existing before the works to construct or improve the highway were begun; and
4. The contribution to the increase in the relevant noise level from the new or altered highway must be at least 1.0 dB(A).

10.2.3 The Highways Agency has a duty under these regulations to offer sound insulation for residential properties with respect to a new road, and discretionary powers in relation to altered roads. Various discretionary powers are also available in relation to façades or parts of façades contiguous with a qualifying façade. The regulations apply to habitable rooms and so exclude bathrooms, toilets, halls and kitchens that do not include dining areas.

The Environmental Noise (England) Regulations 2006 (as amended 2008, 2009)

10.2.4 The Environmental Noise (England) Regulations 2006 (as amended 2008, 2009) implement the Assessment and Management of Noise Directive 2002/49/EC (known as the Environmental Noise Directive - END). The M3 between Junction 2 and Junction 4a fell under the 'major roads' first round of strategic noise mapping required under the END and traffic noise levels along the M3 were mapped. As required by the Directive, DEFRA produced a 'Noise Action Plan for Major Roads (outside first round agglomerations)' in March 2010.

10.2.5 The Noise Action Plan focuses on those areas most exposed to noise from major roads. These are defined as 'Important Areas' (IA). The Highways Agency is required to identify what noise mitigation measures, if any, are feasible at any of the IAs and consult with Local Authorities on their findings. Once consultations are complete, the Highways Agency is then required to finalise the noise mitigation measures before seeking funding to install the measures proposed.

10.2.6 There are presently 17 IA between J2 and J4a of the M3 motorway. These IA are:

- IA 979 End of Trumpsgreen Road (Runnymede);
- IA 1238 Adjacent to Broadway Road North (Surrey Heath);
- IA 5593 Top of Juniper Road, adjacent to A327 south of M3 J4a (Rushmoor);
- IA 5595 Alsace Walk, on A331, J4 (Surrey Heath);
- IA 5598 Near to M3 J3 south bound slip road (Surrey Heath);
- IA 5627 Strandway House, Oldhouse Lane (Surrey Heath);
- IA 5628 Scutley Lane South (Surrey Heath);
- IA 5629 End property at Brick Hill off Chertsey Road (B386) (Surrey Heath);
- IA 5630 Repeat of IA 5629;
- IA 5631 Either side of Bridge Lane bridge including The Paddocks and Lyne Close (Runnymede);
- IA 5632 Area off Lyne Road, north of carriageway (Runnymede);
- IA 6213 Runs length of carriageway between M3 J4 and J4a (Rushmoor);
- IA 6214 Runs length of carriageway between M3 J4 and the B3015 crossing (The Maultway);

- IA 6217 Approximately 4 km long on the A332 and also including part of the M3;
- IA 6220 Broadway Road South adjacent to M3 (Surrey Heath);
- IA 6221 Highams Lane South, adjacent to M3 carriageway (Surrey Heath); and
- IA 6222 Adjacent to Albury Close, Longcross (Runnymede).

10.2.7 Noise Action Plans have been developed for these IAs. The Highways Agency Initial Investigation Outcomes are subject to change following assessment of Local Authority responses.

10.3 Study Area

10.3.1 At the detailed assessment stage the Study Area for a traffic noise impact assessment is defined in the DMRB as follows:

a) The study area includes the Scheme and all surrounding existing roads that are predicted to be subject to a change in traffic noise level of;

- 1 dB(A) or more in the short term (2015DM to 2015DS), or
- 3 dB or more in the long term (2015DM to 2030DS),

as a result of the Scheme. These road links are defined as 'affected routes' and are identified by analysis of the provided traffic data;

b) The study area for the detailed quantitative assessment of noise impacts comprises a corridor 600 m either side of the Scheme, and a set of corridors 600 m either side of all affected routes within 1km of the proposed scheme;

c) For dwellings and other sensitive receptors that are within 1km of the Scheme, but more than 600m from an affected route, a qualitative assessment of the noise and vibration impacts is carried out; and

d) For affected routes which are outside the 1km boundary from the Scheme, an assessment is undertaken by estimating the Basic Noise Level (as defined in Department of Transport memorandum Calculation of Road Traffic Noise) for these routes with and without the Scheme. A count of the number of dwellings and other sensitive receptors within 50m of these links is undertaken.

10.3.2 Using the long term change criteria outlined above, a number of affected routes have been identified that extend a considerable distance from the Scheme. Closer inspection of the data indicated that, for all of the identified links, other developments in the region unrelated to the Scheme, were responsible for the major part of the 3 dB or more noise level increase (and were identified in the changes from DM2015 to DM2030). Therefore, the criterion for identifying affected routes in the long term has been amended to include a requirement for a 3 dB or more change between 2015DM and 2030DS and a 1 dB or more change due to the Scheme in the future assessment year (2030DM to 2030DS).

10.3.3 The extent of the Scheme and the 1km study area around the Scheme are illustrated in Figures 10.1.1 and 10.1.2. Based on the provided traffic data and the criteria discussed above, a small number of affected routes have been identified within 1km of the Scheme, along with the Scheme itself. These affected routes are located at the M3/M25 Junction. No affected routes have been identified more than 1km from the Scheme.

10.4 Methodology

Construction Noise and Vibration

- 10.4.1 The noise levels generated by construction activities and experienced by nearby sensitive receptors, such as the occupants of residential properties, depends upon a number of variables, the most significant of which are:
- The noise generated by plant or equipment used on site, generally expressed as a sound power level;
 - The periods of operation of the plant on the site, known as its 'on-time';
 - The distance between the noise source and the receptor; and
 - The attenuation due to ground absorption and barrier effects.
- 10.4.2 BS 5228: 2009 'Noise and vibration control on construction and open sites' provides a methodology for the estimation of likely construction noise levels as an equivalent continuous noise level averaged over a suitable assessment period, for example a one-hour period ($LA_{eq,1h}$).
- 10.4.3 BS 5228 contains a database of the noise emission from individual items of equipment and routines which can be used to predict noise from construction activities at identified receptors. The prediction method gives guidance on the effects of different types of ground, barrier attenuation and how to assess the impact of fixed and mobile plant.
- 10.4.4 In order to quantify the likely noise from construction works in accordance with the methods and guidance in BS 5228, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated programme of work. At this stage no such details are available, and therefore a qualitative discussion of construction noise impacts is provided. This is based on the identification of residential properties and other potentially sensitive receptors in the vicinity of the Scheme, the identification of activities which could have a significant effect, and best practice noise control measures.
- 10.4.5 The construction of new gantries along the Scheme and the provision of emergency refuge areas will require piling works. Piling works can be a significant source of vibration.
- 10.4.6 There are no universally applicable formulae for the prediction of the passage of vibration through the ground due to the non-uniform effects of different ground conditions. However, BS 5228 provides a range of measured historical data for a variety of different piling methods. This data has been used to give an indication of the potential for significant vibration effects due to the piling of new gantry foundations.
- 10.4.7 Guidance on the effects of construction vibration in terms of building damage is provided in BS 7385: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration'. It provides guidance on vibration levels likely to result in cosmetic damage, and is referenced in BS 5228. Limits for transient vibration, above which cosmetic damage could occur, are given in Table 10.1. BS 7385 notes that the probability of damage tends towards zero at 12.5 mms^{-1} peak component particle velocity.

Table 10.1: Transient Vibration Guide Values for Cosmetic Damage

Building Type	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings.	50 mms ⁻¹ at 4 Hz and above.	50 mms ⁻¹ at 4 Hz and above.
Unreinforced or light framed structure. Residential or light commercial buildings.	15 mms ⁻¹ at 4 Hz increasing to 20 mms ⁻¹ at 15 Hz.	20 mms ⁻¹ at 15 Hz increasing to 50 mms ⁻¹ at 40 Hz and above.
Note 1: Values referred to are at the base of the building.		
Note 2: For unreinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

10.4.8 The values provided in Table 10.1 are for transient vibration. For continuous vibration, BS 7385 suggests that the values in the table should be reduced by 50%.

10.4.9 Guidance on effects in terms of annoyance to residents is provided in BS 5228 and reproduced below in Table 10.2.

Table 10.2: Guidance on Effects of Vibration Levels in terms of Annoyance

Vibration Level	Effect
0.14 mms ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms ⁻¹	Vibration might be just perceptible in residential environments.
1 mms ⁻¹	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mms ⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

10.4.10 No detailed information on the likely volume of construction traffic is available at the time of writing, although all construction vehicle movements will be along the hard shoulder or centre reserve. Current one-way 18 hour flows on the M3 between Junctions 2 and 4a range from 54,000, with 8% HGV to 63,000 with 9% HGV. Taking the lower flow, an additional 3500 HGV movements per day would be required to provide a 1 dB increase in noise levels to sensitive receptors along the Scheme. This number of HGV movements will not occur during construction works.

10.4.11 On this basis, no further consideration of construction traffic noise impacts is required and is scoped out of this assessment.

Operational Noise

- 10.4.12 Noise from a flow of road traffic is generated by both vehicles' engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (% HGV), gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.
- 10.4.13 Noise from a stream of traffic is not constant; therefore, to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in 'The Calculation of Road Traffic Noise' (CRTN) to assess traffic noise is $LA_{10,18h}$. This value is determined by taking the highest 10% of noise readings in each of the eighteen 1 hour periods between 06:00 and 24:00, and then calculating the arithmetic mean. A reasonably good correlation has been shown to exist between this index and residents' perception of traffic noise over a wide range of exposures.
- 10.4.14 CRTN provides the standard methodology for predicting the $LA_{10,18h}$ road traffic noise level. Noise levels are predicted at a point measured 1 m horizontally from the external façade of the building.
- 10.4.15 The DMRB also requires an assessment of night time traffic noise levels ($L_{night,outside}$), however, this parameter is not predicted by the standard CRTN methodology. Three methods of estimating $L_{night,outside}$ are outlined in the DMRB. Method 1 uses individual 1 hour traffic data over the night-time (23:00-07:00), method 2 uses 8 hour average night time traffic, and method 3 estimates the $L_{night,outside}$ from the $LA_{10,18h}$ traffic noise level. Method 3 has been used for the purposes of this assessment. The façade level predicted by CRTN must be reduced by 2.5 dB to give the free-field $L_{night,outside}$ level.
- 10.4.16 Once the traffic noise level has been predicted it can be used to provide an indication of the likely annoyance to residents caused by traffic noise. Individuals vary widely in their response to the same level of traffic noise. However, the average or community response from a large number of people to the same level of traffic noise is fairly stable, and therefore a community average degree of bother caused by traffic noise can be related to the long-term steady state noise level. The DMRB relationship between the steady state traffic noise level and the estimated annoyance experienced, expressed as the percentage of people 'bothered very much or quite a lot', is illustrated in Plate 1 (taken from DMRB). This shows, for example, that approximately 13% of all residents would be 'bothered very much or quite a lot' at a façade road traffic noise level of 60 dB $LA_{10,18h}$.
- 10.4.17 In addition, research has shown that people are more sensitive to abrupt changes in traffic noise, for example following the opening of a new road, than would be predicted from the steady state relationship between traffic noise and nuisance (described above). These effects last for a number of years, however, in the longer term the perceived noise nuisance tends towards the steady state level due to familiarisation. The percentage change in the traffic noise nuisance due to an abrupt change in the traffic noise is illustrated in Plate 2 (taken from DMRB).

10.4.18 Plate 2 shows, for example, that with an abrupt (and permanent) increase of 10 dB(A) there would be a net change of 45% residents 'bothered very much or quite a lot' by road traffic noise. If the initial noise level was 60 dB $L_{A10,18h}$ (with 13% people already bothered) then there would be a total of 58% bothered immediately after an increase to 70 dB $L_{A10,18h}$. This would eventually diminish in the long term due to familiarisation to become approximately 34% bothered (Plate 1).

Plate 1: Estimation of Traffic Noise Annoyance - Steady State

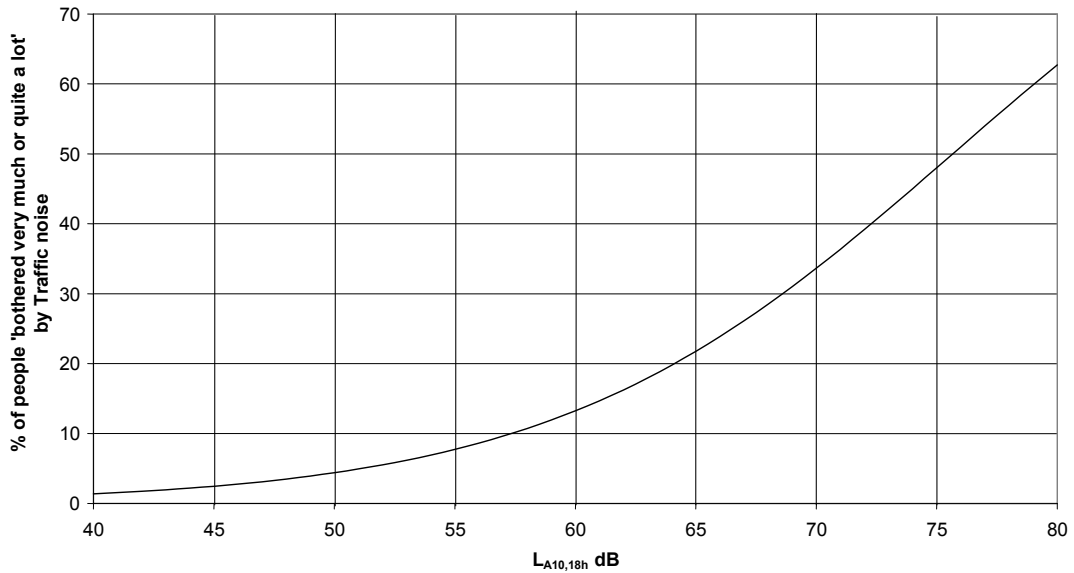
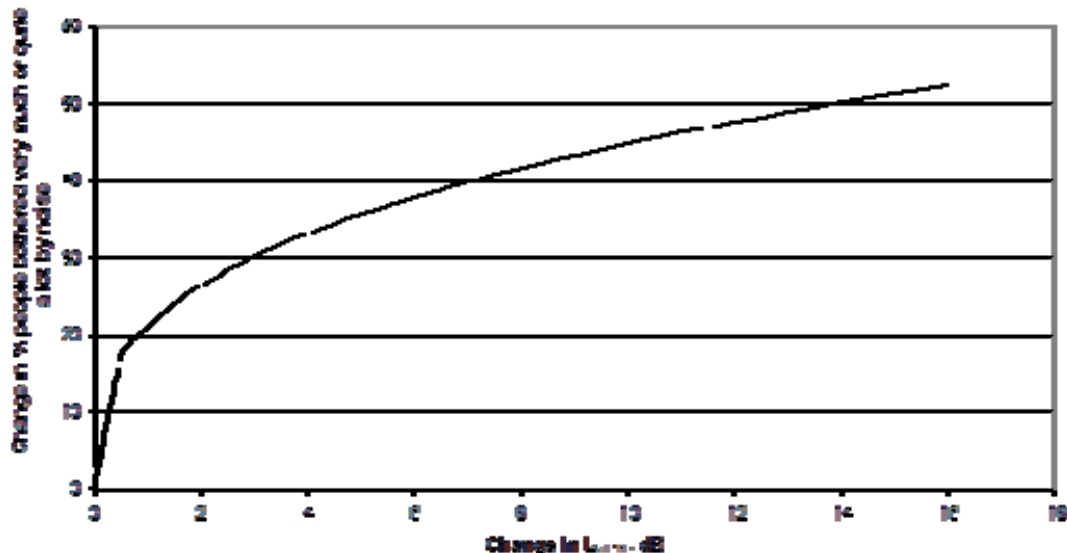


Plate 2: Estimation of Traffic Noise Annoyance - Immediate Change in % people 'bothered very much or quite a lot' by traffic noise



10.4.19 The objective of the assessment, as set out in the DMRB, is to gain an overall appreciation of the noise and vibration climate, both with (Do-Something) and without (Do-Minimum) the Scheme, to identify where noise impacts occur and to determine where mitigation to reduce these impacts is required. These conditions are assessed for the baseline year (the year of opening) and the future assessment year (15 years after opening). The DMRB outlines the steps to be carried out at the detailed assessment stage:

- a) Identify the study area, as discussed above, and predict 18 hour (06:00-00:00) and night-time (23:00-07:00) traffic noise levels at all residential properties within 600m of the Scheme and affected routes within 1km of the Scheme. Predictions are required for the Do-Minimum and Do-Something scenarios in the year of opening and 15 years after opening. The computer noise modelling software SoundPLAN version 7.1, which implements the CRTN methodology and the estimation of $L_{\text{night, outside}}$ levels from $L_{A10, 18h}$ levels, has been used to complete the traffic noise predictions;
- b) Carry out the following comparisons for each property in order to identify the number of properties which undergo an increase or decrease in traffic noise levels and annoyance:
 - The Do-Minimum scenario in the baseline year against the Do-Minimum scenario in the future assessment year (long term) (2015DM to 2030DM);
 - The Do-Minimum scenario in the baseline year against the Do-Something scenario in the baseline year (short term) (2015DM to 2015DS); and
 - The Do-Minimum scenario in the baseline year against the Do-Something scenario in the future assessment year (long term) (2015DM to 2030DS).

For night time traffic noise levels, only the two long term comparisons are required and only properties where the $L_{\text{night, outside}}$ level is 55 dB(A) or more in the relevant scenarios, need to be considered;

- c) Assess the impact on sensitive receptors, other than residential properties, within the 600m study area. This is based on 18 hour (06:00-00:00) traffic noise levels and considers the same three comparisons as outlined above for residential properties. Other sensitive receptors considered include hospitals, schools, community facilities (such as places of worship) designated ecological areas (Areas of Outstanding Natural Beauty (AONB), National Parks, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Site of Special Scientific Interest (SSSI)), designated Scheduled Ancient Monuments (SAM) and Public Rights of Way (PRoW);
- d) Complete a qualitative assessment of sensitive receptors which are within 1km of the Scheme but more than 600m from the Scheme and significant links; and
- e) For significant links which are outside the 1 km boundary from the proposed development, complete an assessment by estimating the Calculation of Road Traffic Noise (CRTN) Basic Noise Level on these roads (the traffic noise level at 10m) with and without the Scheme. A count of the number of dwellings and other sensitive receptors within 50m of these links should be undertaken.

10.4.20 Obviously different façades of the same property can experience different changes in traffic noise level. DMRB requires that each of the above comparisons of traffic noise levels are based on the façade which experiences the worst case change i.e. the largest increase, or, if all facades undergo a decrease, the smallest decrease. Additionally, DMRB requires that the above comparisons of annoyance use the highest levels of annoyance in the first 15 years. For properties which experience an increase in noise due to the proposed development the greatest annoyance is likely to be immediately after opening (Plate 2), for properties which experience a decrease (and also in the Do-Minimum comparison) the greatest annoyance is the steady state level of annoyance in the long term (Plate 1).

10.4.21 The DMRB provides two classifications for the magnitude of the noise impact of a proposed road scheme, as shown in Tables 10.3 and 10.4. These relate to short term changes in noise levels and long term changes in noise levels. Paragraph 3.36 of HD 213/11 includes “HA 205/08 provides a method for the classification of the magnitude of impact and the significance of an effect, in order to arrive at an overall level of significance. In terms of road traffic noise, a methodology has not yet been developed to assign significance according to both the value of the resource and the magnitude of an impact”.

Table 10.3: Classification of Magnitude of Noise Impacts - Short Term

Noise Change $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1-0.9	Negligible
1.0-2.9	Minor
3.0-4.9	Moderate
≥ 5.0	Major

Table 10.4: Classification of Magnitude of Noise Impacts - Long Term

Noise Change $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1-2.9	Negligible
3.0-4.9	Minor
5.0-9.9	Moderate
≥ 10.0	Major

10.4.22 The predicted noise levels at each façade of each residential property have also been used to carry out an initial assessment of the likelihood of any properties qualifying under the Noise Insulation Regulations (NIR). It should be noted that the applicability of the NIR to schemes of this type is under consideration. Ministerial approval is being sought.

Operational Vibration

10.4.23 Vibration from traffic can be transmitted through the air or through the ground. Airborne vibration is produced by the engines and exhausts of road vehicles, with dominant frequencies typically in the range 50 - 100 Hz. Ground borne vibration is produced by the interaction of the vehicle tyres and the road surface with dominant frequencies typically in the range 8 - 20 Hz. The passage of vehicles over irregularities in the road surface can be a source of ground borne vibration.

- 10.4.24 Traffic vibration can potentially have an effect on buildings and cause disturbance to occupiers. DMRB reports that extensive research on a wide range of buildings has found no evidence of traffic induced ground borne vibration being a source of significant damage to buildings. And also, that there is no evidence that exposure to airborne vibration has caused even minor damage.
- 10.4.25 Airborne vibration is noticed by occupiers more often than ground borne vibration as it may result in detectable vibrations in building elements such as windows and doors.
- 10.4.26 Vibration due to traffic on the existing M3 has not been identified as a potential issue. The DMRB states that perceptible vibration only occurs in rare cases and identifies that the normal use of a building, such as closing doors and operating domestic appliances can generate similar levels of vibration to that from traffic.
- 10.4.27 To assess the magnitude of the impact of traffic induced vibration on residents, a parameter is needed which reflects a person's subjective rating of vibration disturbance. DMRB recommends the use of the $L_{A10,18h}$. The relationship between the $L_{A10,18h}$ and bother due to vibration is similar to that for bother due to steady state traffic noise, as shown in Plate 1, except that the percentage of people bothered by vibration is lower. For a given level of noise exposure, the percentage of people bothered very much or quite a lot by vibration is 10% lower than the corresponding figure for annoyance due to traffic noise. Below 58 dB(A) the percentage of people bothered by traffic induced vibration is assumed to be zero.
- 10.4.28 The potential for vibration impacts is limited to the immediate vicinity of a road, and the relationship between bother due to vibration and traffic noise level is based on properties located within 40m of a road. Therefore, at each property within 40m of the Scheme, and at which traffic noise levels are predicted to be 58 dB, $L_{A10,18h}$ or more, the percentage of people likely to be bothered very much or quite a lot by vibration is calculated, based on the annoyance levels in Plate 1, reduced by 10%.

10.5 Value of Resource and Baseline Conditions

Value of Resource

- 10.5.1 Figures 10.1.1 and 10.1.2 show the potentially sensitive receptors identified within 1km of the Scheme.
- 10.5.2 The vast majority of potentially sensitive receptors are residential properties, which are classed as being of high sensitivity to road traffic noise. A total of 23,375 residential properties have been identified within the 1km study area based on OS address point data. Residential properties are generally concentrated within the settlements of Virginia Water, Windlesham, Bagshot, Camberley and Frimley.
- 10.5.3 The following non-residential sensitive properties have been identified within 1 km of the Scheme:
- 42 schools;
 - 17 places of worship;
 - 3 community facilities (parish halls);
 - 1 hospital.

- 10.5.4 The schools and hospital are classed as of high sensitivity to road traffic noise and the places of worship and community facilities as of medium sensitivity.
- 10.5.5 There are also one Special Area of Conservation (SAC), two Special Protection Areas (SPA), five Sites of Special Scientific Interest (SSSI) and four Scheduled Ancient Monuments (SAM) within 1km of the Scheme.

Existing Noise Barriers

- 10.5.6 The following information on existing noise barriers along the extent of the Scheme (and which were included in the noise modelling work for the Existing and future Do Minimum scenarios) was provided:

Concrete Panel Barriers

- E/B carriageway/chainage 1870 to 2360/height 4 metres.

Robust Close Boarded Wooden Fencing

- E/B carriageway/chainage 20720 to 21200/height 3 metres.
- E/B carriageway/chainage 21240 to 21460/height 3 metres.
- W/B carriageway/chainage 2760 to 2800/height 2 metres.
- W/B carriageway/chainage 2835 to 3000/height 2.5 metres.
- W/B carriageway/chainage 17510 to 17800/height 4 metres.
- W/B carriageway/chainage 18510 to 19100/height 1.5 metres.

Wooden Framed Noise Barriers

- E/B carriageway/chainage 13125 to 13890/height 4 metres.
- E/B carriageway/chainage 14950 to 16315/height 4 metres.
- E/B carriageway/chainage 16450 to 18815/height 4 metres.
- E/B carriageway/chainage 19175 to 19610/height 2 metres.
- E/B carriageway/chainage 20130 to 20725/height 3 metres.
- E/B carriageway/chainage 21465 to 21690/height 3 metres.
- E/B carriageway/chainage 21690 to 22220/height 1.5 metres.
- E/B carriageway/chainage 22220 to 22325/height 3 metres.
- W/B carriageway/chainage 14970 to 16315/height 3 metres.
- W/B carriageway/chainage 16450 to 17510/height 3 metres.
- W/B carriageway/chainage 17805 to 18500/height 4 metres.
- W/B carriageway/chainage 20100 to 21240/height 2 metres.
- W/B carriageway/chainage 21275 to 22510/height 4 metres.

Existing Conditions

- 10.5.7 Attended noise monitoring was carried out at 10 locations along the proposed Scheme between 10 March and 5 June 2010. The measurements conformed to the requirements of the “shortened measurement procedure” as defined in the Calculation of Road traffic Noise (CRTN).
- 10.5.8 The purpose of the monitoring was to provide a set of measured noise levels for comparison with the calculated noise levels at the same locations for the current baseline. In this case, the current baseline year was 2009, for which traffic data were provided.

- 10.5.9 The meteorological conditions during the monitoring periods were within the limits defined in CRTN and BS 7445: 2003 'Description and measurement of environmental noise' for environmental noise monitoring. The monitoring was undertaken in accordance with the requirements of BS 7445.
- 10.5.10 The monitoring locations, labelled M01 to M10, are shown in Figures 10.1.1 and 10.1.2.
- 10.5.11 The monitoring locations, measured $L_{A10, 3h}$ values, the derived $L_{A10, 18h}$ values and the calculated $L_{A10, 18h}$ values from the present modelling work are provided in Table 10.5.

Table 10.5: Summary of Measured Noise Levels and Comparison with Calculated Noise levels

Location	Address	Monitored $L_{A10, 3h}$	Derived $L_{A10, 18h}$	Calculated $L_{A10, 18h}$ (2009)
M01	Lyne Close, GU25 4EA	69.7	68.7	69
M02	Badgerwood Drive, GU16 8UE	70.4	69.4	68
M03	Avon Close, GU14 9LN	66.5	65.5	64
M04	Albury Close, KT16 0EB	56.9	55.9	59
M05	Highams Lane, GU24 8TD	62.0	61.0	65
M06	Butler Road, GU19 5QF	60.3	59.3	63
M07	Martel Close, GU15 1QS	62.8	61.8	60
M08	Ferniehurst, GU15 2DQ	66.0	65.0	63
M09	Curley Bridge Close, GU14 9AU	64.0	63.0	66
M10	Staple Hill (Chobham Common)	78.3	77.3	73

- 10.5.12 Comparison of the derived $L_{A10, 18h}$ noise levels with the calculated $L_{A10, 18h}$ noise levels shows good agreement for the majority of locations. For seven of the monitoring locations, the difference is 3 dB or less. For the remaining three locations, the difference is 4 dB. These comparisons provide confidence that the model developed to estimate the noise impacts of the Scheme is robust and can be employed to accurately quantify the changes in noise levels and nuisance.

Do Minimum Conditions

- 10.5.13 A summary of overall Do-Minimum traffic noise levels and the change from the opening year to the future assessment year is provided in Table 10.6. A total of 13618 residential properties are located within 600 m of the Scheme and affected routes. However, only 3398 of those properties meet the DMRB criterion of 55 dB $L_{night, outside}$ at one or more façades, in one or more scenarios, for inclusion in the night time traffic noise assessment.
- 10.5.14 Sensitive properties other than residential properties within 600m of the Scheme and affected routes consist of three places of worship, 25 schools and one hospital.
- 10.5.15 Table 10.6 is based on the façade at each building which undergoes the worst change in traffic noise level from the 2015 Do-Minimum scenario to the 2030 Do-Minimum scenario.

Table 10.6: Long-term Change in Traffic Noise Levels (2015 DM to 2030 DM)

Change in Noise Level		Daytime		Night-time
		Number of dwellings	Number of other sensitive receptors	Number of dwellings
Increase in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{night,outside}$ dB	0.1-2.9	840	4	245
	3.0-4.9	0	0	0
	5.0-9.9	0	0	0
	≥10	0	0	0
No Change	0	161	1	65
Decrease in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{night,outside}$ dB	0.1-2.9	11422	21	3082
	3.0-4.9	1195	3	6
	5.0-9.9	0	0	0
	≥10	0	0	0

- 10.5.16 For daytime, 84% of residential properties experience a negligible decrease in traffic noise levels from 2015 to 2030, in the absence of the Scheme. This is a consequence of the provision of a low noise surface to the M3 at some time before 2030 as part of on-going maintenance, even though traffic flows are generally predicted to increase slightly over time.
- 10.5.17 A negligible increase in traffic noise levels would be experienced at 840 residential properties, 1195 properties experience a minor decrease in traffic noise levels and 161 properties experience no change.
- 10.5.18 The changes in night-time noise levels show a similar pattern to the daytime changes, albeit with significantly fewer properties included in the assessment.
- 10.5.19 For non-residential sensitive receptors, 21 experience a negligible decrease, four experience a negligible increase, three experience a minor decrease and one experiences no change.
- 10.5.20 The noise changes from 2015 DM to 2030 DM are presented as noise difference contour plots in Figures 10.2.1 to 10.2.4. The maps are based on free-field traffic noise levels at first floor level (4 m above ground).
- 10.5.21 Figures 10.2.1 to 10.2.4 show that the vast majority of the study area experiences a reduction in noise levels between 2015 DM and 2030 DM. The SAC, SPA and SSSI identified in Figures 10.1.1 and 10.1.2 are not included in the results in Table 10.6. However, the noise changes across these areas can be seen in Figures 10.2.1 to 10.2.4, which show the general reductions in noise levels.

10.6 Mitigation and Detailed Scheme Development

Construction

10.6.1 A range of good site practices would be adopted in order to mitigate construction phase noise and vibration (as detailed in the Construction Environmental Management Plan (CEMP)). Such measures, and other good site practice mitigation techniques, are defined below:

- Proper use of plant with respect to minimising noise emissions and regular maintenance. All vehicles and mechanical plant used for the purpose of the works to be fitted with effective exhaust silencers and to be maintained in good efficient working order;
- Selection of inherently quiet plant where appropriate. All major compressors to be 'sound reduced' models fitted with properly lined and sealed acoustic covers which are kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools to be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Machines in intermittent use to be shut down in the intervening periods between work or throttled down to a minimum;
- All ancillary plant such as generators, compressors and pumps to be positioned so as to cause minimum noise disturbance. If necessary, acoustic barriers or enclosures to be provided. A well-constructed 3m high timber barrier can reduce noise levels by 5 – 10 dB;
- Adherence to the codes of practice for construction working and piling given in British Standard BS 5228:2009 and the guidance given therein for minimising noise emissions from the site; and
- Where appropriate, provision of close boarded wooden fencing to sensitive receptors when estimated construction noise levels exceed the adopted criterion for particular activities.

10.6.2 In order to minimise the likelihood of complaints, the Local Authorities and affected residents would be kept informed of the works to be carried out, and of any proposed work outside normal hours. Residents would be provided with a point of contact for any queries or complaints.

Scheme Design

10.6.3 For this Scheme, preliminary additional noise barriers have been specified to provide noise mitigation to groups of receptors which are predicted to experience noise increases greater than 1 dB as a result of the Scheme. These additional barriers are as follows:

- E/B carriageway/chainage 2350 to 2700 and 2700 to 2800/height 2.5 metres/reflective;
- E/B carriageway/chainage 2810 to 2940⁸/height 2 metres/reflective;
- E/B carriageway/chainage 8320 to 8525/height 2.5 metres/reflective;
- E/B carriageway/chainage 10800 to 10980 and 10980 to 11150/height 2.5 metres/reflective;
- E/B carriageway/chainage 12500 to 12750/height 2.5 metres/reflective/to E/B on-slip;

⁸ Additional noise modelling is being carried out to chainage 2940-3100 in response to recent comments to establish whether noise levels in this area warrant an extension of the proposed noise barrier by an additional 100m.

- E/B carriageway/chainage 12850 to 13125/height 3 metres/reflective/to E/B off-slip;
- E/B carriageway/chainage 18800 to 19175/height 4 metres/absorptive;
- E/B carriageway/chainage 22325 to 22425/height 3.5 metres/absorptive/partially to E/B on-slip;
- W/B carriageway/chainage 2400 to 2600 and 2600 to 2800/height 2.5 metres /reflective;
- W/B carriageway/chainage 2810 to 2850/height 2 metres/reflective;
- W/B carriageway/chainage 9000 to 9400/height 2.5 metres/reflective;
- W/B carriageway/chainage 12500 to 12750/height 2.5 metres/reflective/to W/B off-slip;
- W/B carriageway/chainage 22500 to 22650/height 4 metres/reflective.

10.6.4 According to the DMRB methodology, a carriageway can only be treated as a low noise carriageway if the surfacing across the carriageway is predominantly thin surface. It is not intended to resurface all lanes of the Scheme prior to opening (only lanes 1 and 4 will be resurfaced) and hence each carriageway will not be predominantly low noise and cannot be treated as a low noise carriageway.

10.6.5 However, it is likely that the length of the Scheme will be resurfaced with a low noise surface at some time in the future before 2030 as part of on-going maintenance works. Hence, the following assumptions have been made, based on advice.

- 2009 current baseline – standard HRA road surface;
- 2015 Do-Minimum – standard HRA road surface;
- 2015 Do-Something – standard HRA road surface;
- 2030 Do-Minimum – low noise road surface; and
- 2030 Do-Something – low noise road surface.

10.6.6 CRTN provides advice on appropriate road surface corrections to be applied within noise assessments. However, this advice does not currently extend to the range of proprietary thin bituminous surfacing materials, commonly regarded as a low noise surfacing, which emerged in the late 1990s.

10.6.7 Annex A4 of HD 213/11 includes advice on road surface corrections for these surfacing materials. A correction of -3.5 dB(A) should be applied for a low noise surface at road speeds of 75km/h and above.

10.7 Magnitude of Impacts

Construction Noise and Vibration

10.7.1 At this stage only limited information on the likely construction works is available. However, all works will be contained within the existing highway boundary. To construct the Scheme the works will include the following:

- Site clearance;
- Cabling;
- Earthworks;
- Sheet piling at ERAs;
- Gantry piling;
- Drainage installation;
- Carriageway resurfacing;

- ERA surfacing;
 - Fill to verges;
 - Installation of safety fencing;
 - Protection/strengthening works to bridge piers;
 - Landscaping;
 - Gantry and mast erection; and
 - Use of the existing hard shoulder as a haul road.
- 10.7.2 The works with the potential to result in the most significant noise impacts are the earthworks and the piling required for gantries and ERAs.
- 10.7.3 There will likely be a requirement to remove existing noise barriers as part of the construction. There will be the potential for residents to be exposed to increased traffic noise which they were previously protected from. This will be offset to a greater or lesser extent by the imposition of speed limits within the construction area. Notwithstanding this, where existing noise barriers are removed, they should be replaced with temporary noise barriers.
- 10.7.4 The majority of the works will be carried out during the daytime, though it is envisaged that necessary night time works will be required near sensitive receptors. Once the detailed construction schedule is finalised, calculation of noise levels to sensitive receptors will be carried out and mitigation strategies developed. This will require close liaison with the relevant Local Authorities pollution control / environmental health departments.
- 10.7.5 Based on the nature of the works and the proximity of potentially sensitive receptors, the magnitude of the impact of construction noise is classed as minor adverse, assuming the developed mitigation strategy is in place.
- 10.7.6 Regarding vibration impacts, there is the possibility that both vibratory piling and impact piling may be carried out, depending on ground conditions.
- 10.7.7 BS 5228-2 provides a database of measured ground vibration levels for different piling methods and a range of ground conditions. Applicable subsets of these data were extracted to estimate stand-off distances from sensitive receptors for proposed piling works.
- 10.7.8 The stand-off distances for human response ($< 1 \text{ mm/s}$ with reference to Table 10.2) are given in Table 10.7 and the stand-off distances for cosmetic building damage ($< 7.5 \text{ mms}^{-1}$ for continuous vibration with reference to Table 10.1) are given in Table 10.8.
- 10.7.9 It is suggested that a conservative approach is taken for vibration in relation to cosmetic building damage and that the stand-off distance for vibratory piling is adjusted to 5m to account for uncertainty.

Table 10.7: Stand-off Distances for Human Response

Piling Method	Stand-off Distance to Achieve mms^{-1} PPV (metres)
Vibratory	35
Impact	45

Table 10.8: Stand-off Distances for Cosmetic Building Damage

Piling Method	Stand-off Distance to Achieve mms^{-1} PPV (metres)
Vibratory	2
Impact	15

10.7.10 Thus, stand-off distances in relation to human response are 35m for vibratory piling and 45m for impact piling. Stand-off distances in relation to cosmetic building damage are 5m for vibratory piling and 15m for impact piling.

10.7.11 Based on the draft schedule of verge widening solutions for ERA and gantries, it is estimated that there may be 14 locations where piling works are within 45m of properties and eight locations where piling works are within 35m. It is understood that bored piling will be used for all locations within 35m of properties. There should be no significant nuisance impacts, nor cosmetic building damage on any other properties.

Operational Noise and Vibration

10.7.12 Table 10.9 summarises the short term change in traffic noise levels in 2015 between the Do-Minimum and Do-Something scenarios at both residential properties and other sensitive receptors within the 600m study area. Table 10.10 summarises the long term change between the 2015 Do-Minimum and 2030 Do-Something scenarios. All the comparisons are based on the façades which experiences the worst case change in traffic noise levels for that comparison.

Table 10.9: Short-term Change in Traffic Noise Levels (2015 DM to 2015 DS)

Change in Noise Level		Daytime	
		Number of dwellings	Number of other sensitive receptors
Increase in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{\text{night,outside}}$ dB	0.1-0.9	7977	21
	1.0-2.9	20	0
	3.0-4.9	0	0
	≥ 5	0	0
No Change	0	2192	5
Decrease in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{\text{night,outside}}$ dB	0.1-0.9	3356	3
	1.0-2.9	65	0
	3.0-4.9	6	0
	≥ 5	2	0

Table 10.10: Long-term Change in Traffic Noise Levels (2015 DM to 2030 DS)

Change in Noise Level		Daytime		Night-time
		Number of dwellings	Number of other sensitive receptors	Number of dwellings
Increase in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{night,outside}$ dB	0.1-2.9	863	4	261
	3.0-4.9	0	0	0
	5.0-9.9	0	0	0
	≥ 10	0	0	0
No Change	0	177	1	67
Decrease in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{night,outside}$ dB	0.1-2.9	12221	23	2945
	3.0-4.9	337	1	110
	5.0-9.9	20	0	15
	≥ 10	0	0	0

10.7.13 Table 10.11 provides the worst case change in traffic noise nuisance for the Do-Minimum and Do-Something scenarios.

Table 10.11: Worst Case Change in Traffic Noise Nuisance

Change in Nuisance Level		Do-Minimum	Do-Something
		Number of dwellings	Number of dwellings
Increase in nuisance level	<10%	840	2692
	10<20%	0	4148
	20<30%	0	77
	30<40%	0	0
	$\geq 40\%$	0	0
No Change	0	161	2251
Decrease in nuisance level	<10%	12616	4448
	10<20%	1	2
	20<30%	0	0
	30<40%	0	0
	$\geq 40\%$	0	0

10.7.14 In the short term 58% of residential properties experience a negligible (0.1 - 0.9 dB) increase, substantially less than 1% experience a minor (1.0-2.9 dB) increase, 16% experience no change and 24% experience a negligible reduction in traffic noise, with 65 properties experiencing a minor decrease and eight properties experiencing a moderate or major decrease. These noise level changes are a result of a number of interacting factors, including:

- Traffic moving closer to properties for the Do Something scenario;
- Changes in ground topography close to the Scheme between Do minimum and Do Something scenarios;

- Changes in noise attenuation provided by existing noise barriers and ground features as a result of the movement of the traffic noise source line between the Do Minimum and Do Something scenarios; and
 - Provision of new noise barriers.
- 10.7.15 For non-residential sensitive receptors, 21 experience a negligible increase, five experience no change and three experience a negligible decrease.
- 10.7.16 In the long term 90% of residential properties experience a negligible (0.1-2.9 dB) decrease, 3% experience a minor (3.0-4.9 dB) or moderate (5.0-9.9 dB) decrease, 6% experience a negligible (0.1-2.9 dB) increase and 1% experience no change. This is a consequence of the expected provision of a low noise surface to the M3 at some time before 2030 as part of on-going maintenance, even though traffic flows are generally predicted to increase slightly over time.
- 10.7.17 The long-term changes in night-time noise levels show a similar pattern to the daytime changes, albeit with significantly fewer properties included in the assessment.
- 10.7.18 For non-residential sensitive receptors, 23 experience a negligible decrease, one experiences a minor decrease, four experience a negligible increase and one experiences no change in the long-term.
- 10.7.19 The noise changes from 2015 DM to 2015 DS are presented as noise difference contour plots in Figures 10.3.1 to 10.3.4. The maps are based on free-field traffic noise levels at first floor level (4m above ground).
- 10.7.20 The noise changes from 2015 DM to 2030 DS are presented as noise difference contour plots in Figures 10.4.1 to 10.4.4. The maps are based on free-field traffic noise levels at first floor level (4m above ground).
- 10.7.21 The noise changes from 2030 DM to 2030 DS are presented as noise difference contour plots in Figures 10.5.1 to 10.5.4. The maps are based on free-field traffic noise levels at first floor level (4m above ground).
- 10.7.22 Examination of Table 10.11 shows that, for the Do-Minimum changes, the vast majority of residential properties experience a reduction in nuisance, with a relatively small number of properties experiencing an increase in nuisance or no change. For the Do-Something changes; the situation is rather different, as would be expected, with the majority of residential properties experiencing an increase in nuisance. This is a consequence of the assessment being based on the worst-case changes in the first 15 years after opening, which includes the abrupt changes in nuisance on Scheme opening. In the long term, the nuisance will reduce to a level comparable to that for the Do-Minimum scenario.
- 10.7.23 Figures 10.3.1 to 10.3.4 show that the vast majority of the study area experiences a negligible change in traffic noise levels in the short term when comparing the 2015 Do-Minimum and 2015 Do-Something scenarios. For the long term, Figures 10.4.1 to 10.4.4 show that the vast majority of the study area experiences a reduction in noise levels when comparing the 2015 Do-Minimum and 2030 Do-Something scenarios.

- 10.7.24 The results of the preliminary Noise Insulation Regulations assessment indicate that one property may meet the criteria. However, as stated earlier, the applicability of the NIR to schemes of this type is under consideration. Ministerial approval is being sought.
- 10.7.25 At sensitive receptors located beyond the 600m quantitative study area, but within the 1km study area, the magnitude of the impact of the Scheme is assessed as negligible in the short term. This is evident from the noise level difference contours shown in Figures 10.3.1 to 10.3.4, where the changes in noise level at the 600m boundary are negligible. Examination of Figures 10.4.1 to 10.4.4 indicates that the magnitude of the impact of the Scheme is assessed as negligible/minor beneficial in the long term, although the robustness of the CRTN method becomes uncertain at distances over 600m.
- 10.7.26 Table 10.12 provides the worst case change in traffic vibration nuisance for the Do-Minimum and Do-Something scenarios. A total 422 residential properties have been identified within 40m of the Scheme.

Table 10.12: Worst Case Change in Traffic Airborne Vibration Nuisance

Change in Nuisance Level		Do-Minimum	Do-Something
		Number of dwellings	Number of dwellings
Increase in nuisance level	<10%	0	0
	10<20%	0	0
	20<30%	0	0
	30<40%	0	0
	≥40%	0	0
No Change	0	0	0
Decrease in nuisance level	<10%	422	385
	10<20%	0	37
	20<30%	0	0
	30<40%	0	0
	≥40%	0	0

- 10.7.27 For the Do-Minimum scenario, all 422 properties fall within the <10% decrease in annoyance band. For the Do-Something scenario, 385 properties fall within the <10% decrease in annoyance band, with the remaining 37 within the 10<20% decrease in annoyance band.

10.8 Significant Effects (including cumulative)

Construction Noise and Vibration

- 10.8.1 Based on the likely magnitude of the construction noise impacts and the sensitivity of the identified receptors, the significance of construction noise effects is classed as minor adverse, assuming the developed mitigation strategy is in place.
- 10.8.2 Based on the likely magnitude of the construction vibration impacts and the sensitivity of the closest identified receptors the significance of construction vibration effects is classed as minor adverse.

Operational Noise and Vibration

10.8.3 The overall significance of the noise and vibration impacts of the Scheme in the short term is classed as negligible adverse.

10.8.4 The overall significance of the noise and vibration impacts of the Scheme in the long term is classed as negligible beneficial.

10.9 Limitations of Assessment

10.9.1 Only very limited information is currently available on the nature and durations of the various construction works. No details of specific activities or plant are currently available, which are required to complete a detailed quantitative noise assessment.

10.9.2 The operational assessment is dependent on the accuracy of supplied data for information for employment in the modelling work. These data and information include:

- Assumed road surface characteristics for the Baseline Year and future Assessment Year;
- Supplied information on the extent and heights of existing noise barriers;
- road traffic data for future years, with and without the Scheme;
- 3D topo survey; and
- 3D Scheme design.

10.10 Summary

10.10.1 Full details of the likely construction works were not available at the time of writing, however all works will be contained within the existing highway boundary.

10.10.2 The works with the potential to result in the most significant noise impacts are the earthworks and the piling required for gantries and ERAs.

10.10.3 There will likely be a requirement to remove existing noise barriers as part of the construction. There will be potential for residents to be exposed to increased noise which they were previously protected from. This will be offset to a greater or lesser extent by the imposition of speed limits within the construction area. Notwithstanding this, where existing noise barriers are removed, they should be replaced with temporary noise barriers.

10.10.4 The majority of the works will be carried out during the daytime, though it is envisaged that necessary night time works will be required near sensitive receptors. Once the detailed construction schedule is finalised, calculation of noise levels to sensitive receptors will be carried out and mitigation strategies developed. This will require close liaison between the Contractor and the relevant Local Authorities pollution control/environmental health departments.

10.10.5 There is the possibility that both vibratory piling and bored piling may be carried out, depending on ground conditions.

- 10.10.6 At the time of writing, it is estimated that there may be 14 locations where piling works are within 45m of properties and eight locations where piling works are within 35m. It is understood that bored piling will be used for all locations within 35m of properties. There should be no significant nuisance impacts, nor cosmetic building damage on any other properties.
- 10.10.7 Based on the likely magnitude of the construction noise impacts and the sensitivity of the identified receptors, the significance of construction noise effects is classed as minor adverse, assuming the developed mitigation strategy is in place.
- 10.10.8 Based on the likely magnitude of the construction vibration impacts and the sensitivity of the closest identified receptors the significance of construction vibration effects is classed as minor adverse.
- 10.10.9 For the Scheme in operation:
- In the short term 58% of residential properties are predicted to experience a negligible (0.1 - 0.9 dB) increase, substantially less than 1% experience a minor (1.0-2.9 dB) increase, 16% experience no change and 24% experience a negligible reduction in traffic noise, with 65 properties experiencing a minor decrease and 8 properties experiencing a moderate or major decrease. These noise level changes are a result of a number of interacting factors, including:
- Traffic moving closer to properties for the Do Something scenario;
 - Changes in ground topography close to the Scheme between Do minimum and Do Something scenarios;
 - Changes in noise attenuation provided by existing noise barriers and ground features as a result of the movement of the traffic noise source line between the Do Minimum and Do Something scenarios; and
 - Provision of new noise barriers.
- a) In the long term 90% of residential properties experience a negligible (0.1-2.9 dB) decrease, 3% experience a minor (3.0-4.9 dB) or moderate (5.0-9.9 dB) decrease, 6% experience a negligible (0.1-2.9 dB) increase and 1% experience no change. This is a consequence of the provision of a low noise surface to the M3 at some time before 2030 as part of on-going maintenance, even though traffic flows are generally predicted to increase slightly over time.
- 10.10.10 The overall significance of the noise and vibration impacts of the Scheme in the short term is classed as negligible adverse.
- 10.10.11 The overall significance of the noise and vibration of the Scheme in the long term is classed as negligible beneficial.

10.11 References

Highways Agency, 2011, Design Manual for Roads and Bridges (DMRB) Vol. 11, Section 3, Part 7 HD 213/11-Revision 1.

Calculation of Road Traffic Noise, 1994, Department of the Environment.

British Standards Institute BS 5228:2009 'Noise and vibration control on construction and open sites'.

British Standards Institute BS 7385: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration'.

The Environmental Noise Directive (2002/49/EC), 2002.

The Noise Insulation (Amendment) Regulations, 1988, Statutory Instrument No. 2000.

The Noise Insulation Regulations, 1975, Statutory Instrument No. 1763.

British Standards Institute BS 7445: 2003 'Description and measurement of environmental noise'.

Her Majesty's Stationery Office (HMSO), 2009: 'The Environmental Noise (England) (Amendment) Regulations 2009'.

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Her Majesty's Stationery Office (HMSO), 2006: 'The Environmental Noise (England) Regulations 2006'.

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Defra, Noise Action Plan Major Roads (outside first round agglomerations), 2010.

11. ASSESSMENT OF CUMULATIVE EFFECTS

11.1 Introduction

11.1.1 This Chapter describes the potential cumulative impacts that could arise from the interaction between the construction and operation of the M3 J2 to 4a Smart Motorway Scheme and other major transport and land development projects in the area. DMRB states that during the assessment of the potential environmental implication of highways schemes, regard should be given to the possibility of cumulative effects, both beneficial and adverse.

11.2 Methodology and Significance Criteria

11.2.1 The prediction and evaluation of cumulative impacts is not straightforward, as the interaction between schemes is potentially complex and subject to change if development projects are delayed or postponed. Nevertheless, DMRB requires that projects consider cumulative effects (beneficial and adverse) as associated with other projects. DMRB guidance further suggests that it is appropriate to consider the cumulative effects of the proposed development, other existing or consented developments and schemes which are 'reasonably foreseeable' to occur within the timescale of the proposed development.

11.2.2 As stated in DMRB guidance; "reasonably foreseeable is interpreted to include other projects that are 'committed'. These should include (but not necessarily be limited to):

- *Trunk road and motorway projects that have been confirmed (i.e. gone through the statutory processes).*
- *Development projects with valid planning permissions as granted by the Local Planning Authority, and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken".*

11.2.3 Further guidance on the definition of reasonably foreseeable schemes has been provided in the Highways Agency Cumulative Assessment Requirements Instruction Note (Highways Agency, January 2013). *"Committed' projects should not necessarily be limited to those with planning permission or other statutory permissions. This Note explains that Projects that are 'likely to happen while some uncertainty remains' are also included in this clarified definition of reasonably foreseeable actions and should be included in the cumulative effects assessment. This might include projects where:*

- *Intent announced by proponent to regulatory agencies, e.g. in National Policy Statements, Government Department announcements;*
- *Submission of planning or consent application is imminent/highly likely;*
- *Development application is within the consent process".*

11.2.4 For the purpose of this Environmental Assessment Report (EAR), cumulative impacts have been defined as follows:

- **Type 1 effects (also known as inter-relationships)** – Impacts that arise from the accumulation of different impacts at a specific location. For example, construction noise and visual intrusion affecting a receptor – individually these may not be significant, but the accumulation of different impacts may give rise to an overall significant impact.

- **Type 2 effects** – Impacts which are the result of the combination of activities associated with the M3 J2 to J4a Scheme together with other development projects. For example, impacts caused by the construction of the Scheme may be exacerbated by the construction activity from other major construction projects nearby) or non-significant individual ecological impacts at different sites collectively may give rise to an overall significant ecological impact in the region.

11.2.5 The assessment aims to identify the potential for cumulative impacts to occur during the Scheme construction and operation, and where possible, identify the possibility of significant impacts. In determining the possible significance of such cumulative impacts, the location and timing of potential developments and their associated impacts have been taken into account. When addressing the temporal nature of changes, consideration has been given to whether cumulative impacts would be temporary or permanent and if temporary, their likely duration.

11.3 Assumptions and Limitations

11.3.1 In the assessment of inter-relationships between environmental impacts considered in the EAR, it has been considered appropriate to use the study areas used in each respective chapter.

11.3.2 For the assessment of cumulative environmental effects of the Scheme when considered with those of other surrounding developments, the study area is defined as the proximity of the developments likely to impact on the same receptors as the Scheme.

11.3.3 There is a limitation in defining programmes for construction and operation of proposed developments. Proposed development programmes are often inaccurate, as they can be brought forward or delayed. It is therefore an assumption that any published proposals, including the M3 Junction 2 to 4a proposals, accurately reflect the temporal proximity of the respective development.

11.3.4 It is not possible to envisage what schemes would be in operation over the life of the Scheme, nor any construction or decommissioning activities that would be underway. For those reasons only published scheme proposals are considered in this cumulative effects assessment, and the cumulative effect of decommissioning has not been considered.

11.4 Baseline Conditions

Introduction

11.4.1 In order to assess the potential for cumulative effects, it is necessary to define the potential location and timing of nearby developments. The sections below define the potential transport infrastructure and land development projects that may occur in the vicinity of the Scheme within the timeframe of the commission. Speculative developments have not been considered given the uncertainty that they would happen. It is noted that most of the developments referred to herein would require a separate assessment of their environmental effects to be undertaken by the relevant project sponsor.

Transportation Schemes

11.4.2 Table 11.1 describes the transportation schemes which have been identified in the vicinity of the Scheme and included in the traffic forecast modelling for the Scheme.

Table 11.1: Transportation Schemes

Location	Base Year (2009)	Future Years Scheme (2015/2030)
A3 Hindhead	Construction of a new dual carriageway link between London and Portsmouth including twin tunnels carrying traffic underneath the Devil's Punch Bowl SSSI; resulting in reduced capacity and speed limits throughout the surrounding area.	New Tunnel bypass to Hindhead with 70mph limit. NB: This scheme was completed in July 2011.
M4 Junction 11	Reduced speed limits throughout the junction and immediate area. Reduced capacity due to roadworks both on the A33 approaching and across the junction and on the M4 through the junction following the removal of the hard shoulder.	Junction remodelled with the A33 widened through the junction and a bus lane added. Normal speed limits restored. Access from the junction to Whitley Wood Road removed.
M4 Junction 4B to Junction 4 Eastbound	Reduced speed limits along the Eastbound carriageway and at the junction roundabout itself due to roadworks associated with the redesign of Junction 4.	Normal speed limits restored and increased capacity at the junction roundabout.
M25 Junction 5 to Junction 7	Three Lanes	Managed Motorway NB: Construction works on this scheme is due to commence in Spring 2013 and expected to be completed by the end of December 2014.
M25 Junction 16 to Junction 17	Three lanes with roadworks due to widening, resulting in reduced speeds.	Roadworks completed, normal speeds restored and section widened to four lanes.
M25 Junction 17 to Junction 23	Three Lanes	Widened to four lanes.
M25 Junction 23 to Junction 27	Three Lanes	Managed Motorway NB: Construction works on this scheme is due to commence in Spring 2013 and expected to be completed by the end of December 2014.
M25 Junction 27 to Junction 30	Three Lanes	Widened to four lanes
A404 Bisham Roundabout	Roundabout	Replaced roundabout with signals.
Winnersh Park and Ride	A 3290 Roundabouts	Replaced three roundabouts with signals.

Location	Base Year (2009)	Future Years Scheme (2015/2030)
M4 Junction 4B	M25 anti clockwise to M4 westbound 2 lane slips. M25 clockwise to M4 eastbound 2 lane slip	Reduced Capacity from 2 lane to 1 lane on only part of the slips.
Runnymede Roundabout	Roundabout	Changes in roundabout layout.
Slough City Centre		New City Centre layout following regeneration.
Bracknell	Roundabout	Changes to roundabout layout.
Roundabout near M4/J4	Roundabout	Change of layout – elimination of a link in the middle of the roundabout.
M4 J3 to J2 Bus Lane	2 Lane plus 1 Bus Lane	3 Lane for all traffic (removal of bus lane).

Major Development Schemes

11.4.3 Table 11.2 details the proposed major development schemes in proximity to the Scheme. The likelihood of these projects occurring is also presented as discussed in the above methodology. Figure 11.1 shows the location of these projects in relation to the Scheme.

Table 11.2 Major Development Schemes

Development Site	Description	Relevant Programme	Likelihood
Former DERA Site Chobham Lane, Longcross, Chertsey	Directly adjacent to the Scheme, the development proposals at the former DERA Site are for demolition of all existing buildings on the site and mixed use redevelopment of the site to provide up to 79,025sqm of employment uses; up to 36,000sqm of data centre uses (including ancillary facilities and parking); up to 200 dwellings; up to 6,300 sqm of ancillary uses (including retail, café/restaurants and a public house. Other uses include health and leisure; child care facilities; along with the creation of ecological habitats, open space and play areas, new vehicular accesses from the existing public highway network and other associated supporting infrastructure such as drainage and parking.	An outline planning application for the project was submitted in October 2012. This was withdrawn and a hybrid planning application was made in July 2013. Subject to planning consent, construction is expected to start in 2014 with completion assumed by 2035.	Anticipated to proceed.

Development Site	Description	Relevant Programme	Likelihood
Princess Royal Barracks, Deepcut	Land located approximately 3.2km from the Scheme, the development proposals at Princess Royal Barracks Site include conversion of Messes and Head Quarters buildings to 81 flats and creation of new access infrastructure (full planning application) as well as demolition of all other existing buildings (except St Barbara's Church and Huntspiel Cottages) and re-development of the site to provide 1,119 new dwellings, a primary school and nursery facility, a village centre and 68.98ha of public open space (outline planning application).	A planning application for the project was submitted in November 2012. Subject to planning consent, construction is expected to start in 2016 with completion assumed by early 2025.	Anticipated to proceed.
Aldershot Urban Extension MOD's Former Aldershot Garrison (Wellesley), Queens Avenue and Alison's Road, Aldershot	Land located approximately 5.2km from the Scheme, the development proposals at MOD's Former Aldershot Garrison Site are for mixed use development of the site to provide 3,850 new homes, a neighbourhood centre, retail/commercial and industrial space, two new primary schools and 110 ha of public open space. Only Maida Zone – Phase 1 is currently being brought forward for development which will provide 228 new homes, open space and infrastructure.	A planning application for the project was submitted in December 2012. Subject to planning consent, construction was expected to commence in 2013. It is anticipated that Maida Zone – Phase of the development will be completed by 2014.	Anticipated to proceed.
Ash Lodge Drive / South Lane, Aldershot	Land located approximately 8km from the Scheme, the development proposals at the Ash Lodge Drive Site are for 22.1 ha of housing development (outline planning application) and 24ha of Suitable Alternative Natural Greenspace (SANG) (full planning application). The development would provide 400 residential dwellings.	A planning application for the project was submitted in November 2012. Subject to planning consent construction is expected to commence in 2013/14, with completion assumed by 2018/19.	Anticipated to proceed.

11.5 Potential Cumulative Impacts

Type 1 Effects

- 11.5.1 The individual assessments for each principal environmental aspect (Chapter 5 – Chapter 11) have addressed issues of interaction and cumulative effects where relevant.

- 11.5.2 The potential interactions identified below focus on the main likely significant cumulative effects rather than reporting every interaction. The severity of cumulative effects will be dependent upon the type and duration of works being undertaken as well as the distance to the work site and carriageway and the intervening topography and vegetation.
- 11.5.3 During Scheme construction, the locations at most risk from cumulative impacts are those in close proximity to construction activities (e.g. within 100m of the proposed works). Receptors in these locations are likely to experience the combined impacts of dust, noise, vibration and visual intrusion. The landscape and visual assessment identified that seven visual receptors, including local residents and users of public right of ways (PRoWs), all within 100m of the proposed works, would experience moderate adverse visual intrusion due to the level of construction activity and the height of proposed equipment (as detailed in Appendix 7.4). An additional 63 visual receptors, also located within 100m of the proposed works would experience slight adverse visual effects. The noise and vibration assessment identified that sensitive residential properties along the Scheme would experience a slight adverse impact as a result of construction activities.
- 11.5.4 Standard mitigation measures have been outlined in the discipline assessments with the aim to control the individual impacts and prevent interaction of impacts from occurring. Landscaping mitigation has been proposed to help reduce the visibility of the new elements of infrastructure, however this will take time to mature. In addition, best practice measures will be implemented, as detailed in a CEMP, to control dust, noise and vibration impacts. The overall effect is likely to be at least as significant as the worst identified individual environmental effect ranging from slight to moderate adverse depending on the receptor. This effect is considered temporary as many of the impacts will occur only during the construction period and any remaining impact will decrease as mitigation planting matures.
- 11.5.5 By year 15 of operation, mitigation planting would assist in filtering views of the new gantries resulting in a slight adverse visual effect for 40 receptors (as detailed in Appendix 7.4). With the installation of the proposed noise barriers, the overall noise and vibration impact on receptors of the Scheme would be negligible adverse. With the implementation of a 60mph speed limit on a section of the M3 between ch 16065-20022 eastbound and ch 16065-20600 westbound (until 2019), the anticipated detrimental change in NO₂ concentrations at 38 receptors near Junction 4 would not be significant (see Figure 5.5 Sheet 3 of 26, Figure 5.6 Sheet 4 of 34 and Figure 5.7 Sheet 4 of 34). The overall cumulative effect on these identified receptors is considered to be slight adverse.
- 11.5.6 During Scheme operation, the increased levels of spray may result in salt deposition in Chobham Common, affecting zones directly adjacent to the carriageway. Due to the small area which would be affected and the fact that the vegetation community present in this area is already being affected by the motorway and thus comprises vigorous grasses and ruderal species, the effect of the impact is considered to be slight adverse. The increase in nitrogen deposition in Chobham Common due to increased traffic emissions is expected to result in a minor adverse impact on Chobham Common. The combination of both effects would result in a slight adverse effect on Chobham Common, which is not considered significant.

Type 2 Effects

- 11.5.7 Air Quality and Noise – The transportation schemes listed in Table 11.1 were incorporated in the traffic modelling predictions. Therefore, the cumulative noise and air effects of these other transportation schemes together with the Scheme have already been incorporated in the results from the air quality and noise and vibration assessments.
- 11.5.8 During construction sensitive receptors on the DERA Site would experience the cumulative air quality and noise and vibration impact from construction activities on both the Scheme and the DERA Site, in particular dust, construction traffic emissions and piling. The use of standard best practice measures on both schemes would limit the cumulative impacts to slight adverse.
- 11.5.9 Traffic modelling incorporated traffic generated by ‘near certain’ or ‘more than likely’ land use developments. These included the DERA site. The cumulative noise and air effects of the DERA Site together with Scheme have therefore already been included in the results from the air quality and noise and vibration assessments.
- 11.5.10 The air quality assessment concluded that overall, receptors surrounding the Scheme would not experience a significant change in air quality during operation. None of the 38 receptors anticipated to experience a detrimental change in NO₂ concentrations are located in or near the DERA Site. Hence there would be no air quality cumulative effects from the development of both schemes.
- 11.5.11 The noise assessment concluded that during operation the majority of the receptors surrounding the Scheme would experience a negligible adverse impact in the short-term and a negligible beneficial impact in the long-term due to the provision of a low noise surface to the M3 at some time before 2030 as part of on-going maintenance. Furthermore, as the DERA Site is already heavily influenced by the noise from the M3 road traffic, the provision of appropriate glazing and a noise barrier (885m long and 5m high – relative to the surrounding ground) have been included in the DERA Site’s proposals to mitigate the existing noise impact from the M3 (Barton Willmore, 2012a). There will be no cumulative noise effects from the development of both schemes in the long term.
- 11.5.12 Landscape and Visual – Of the identified visual receptors, relatively few would have possible views of both the mixed use development on the DERA Site and the Scheme. These receptors are travellers along Chobham Road (23), residents of Wentworth Estate (24), travellers using the railway (25), workers and visitors to Longcross Studios (26), users of the MoD Chertsey Works and Longcross Barracks (27) and users of PRoWs across Chobham Common (28). Receptors 24 and 25 are enclosed within woodland with no views towards either proposal. Strong screening belts of trees and shrubs protect views from receptors 27 and 28 with only glimpsed views available of construction which is considered a negligible impact. Receptors 23 and 26 would experience views towards both developments. Though these may be experienced at the same time, the combination is not considered to increase the level of effect on views of construction of the Scheme alone. This is considered be a slight adverse effect which is not significant.

- 11.5.13 Cultural Heritage – Of the heritage assets identified, relatively few are located within the 1km study area of both the mixed use development on the DERA Site and the Scheme. These assets are the Former Military Buildings (A65), Longcross Church (A76), Lychgate with attached churchyard wall (A77), Barrow Hills (A78) and Barrow Hills Garden Terrace (A79). According to the cultural heritage assessment the setting of these assets would not be affected by the M3 J2-4a Scheme. Hence there would be no cumulative effects on cultural heritage as a result of the Scheme and the DERA site development.
- 11.5.14 Nature Conservation - Cumulative effects on Chobham Common are likely to occur due to the construction and operation of the mixed use development on the DERA Site and the M3 J2-4a Scheme. Demolition, site preparation and construction activities on the DERA Site may lead to liberation of dust and contaminants in surface water run-off, and/or deposition of dust causing indirect habitat damage to Chobham Common. Construction of the M3 J2-4a Scheme would result in vegetation removal, with permanent loss of habitats of approximately 10m² within the SRN boundary as well as increased disturbance and compaction from plant being operated on the verge. The effects of the M3 J2-4a Scheme would be mitigated via the use of appropriate control measures for construction activities detailed in a CEMP. It is also expected that a CEMP would be developed by the contractors developing the DERA Site (Barton Willmore, 2012a). The residual cumulative impact is considered to be slight adverse.
- 11.5.15 During operation there would be cumulative effects on Chobham Common resulting from the increased recreational pressure and urbanisation effects of the new development on the DERA Site and the increased nitrogen deposition and salt deposition due to the M3 J2-4a Scheme. The proposed residential developments at Ash Lodge Drive and Princess Royal Barracks would also lead to increased recreational pressure on the SPA. To mitigate the impacts of the DERA Site development, it was stated in the Outline Planning documents for that scheme that no residential development would be built within 400m of the SPA boundary and that a Suitable Alternative Natural Greenspace (SANG) as well as other quality green infrastructure would be provided to attract new and existing residents away from the SPA (Barton Willmore, 2012a). SANGs have also been proposed for the other two major developments (Barton Willmore, 2012b & Amec, 2012). The overall cumulative effect is considered to be slight adverse.
- 11.5.16 A number of protected species, including heathland birds (Dartford warbler, nightjar, woodlark), other breeding birds and reptiles would be cumulatively affected by the development of the DERA Site and the M3 J2-4a Scheme. During construction, there is potential for cumulative loss of habitat, risk of harm or mortality and disturbance due to noise and human activity from both schemes. The CEMP for the M3 J2-4a Scheme would help ensure that the mitigation proposed is effectively and efficiently implemented on site. The CEMP would include detailed species mitigation strategies, including any seasonal constraints and monitoring, as well as recommend best practice habitat creation measures and management regimes. It is also expected that a CEMP would be developed by the contractors of the DERA Site (Barton Willmore, 2012a). The residual cumulative effect is considered to be neutral.

- 11.5.17 Given the distance between the M3 J2-4a Scheme and the other developments no other significant cumulative effects on single ecological receptors are anticipated. However, the ecological impacts arising from each of the other individual developments could be seen to have an impact on the overall ecological resource in the surrounding area. A more significant area of habitat would be collectively affected due to development occurring on all these other sites. In the long term, the provision of SANGS and open spaces, habitat enhancement and creation measures and/or long-term management planting, as proposed in the different schemes would benefit the ecological resource of the area.
- 11.5.18 Materials – Cumulative effects would arise from the requirements of the M3 J2-4a Scheme and the other committed developments described in Table 11.2 to dispose of any excess of waste materials at a limited number of local landfills. Whilst only a small amount of material would require disposal from the M3 J2-4a Scheme (in comparison with other major development types), the nature of these other developments (i.e. demolition and excavation activities) would mean that they too would require disposal of inert wastes over similar timescales of construction. This could place pressure on availability of local landfill and may therefore require disposal further afield. Waste minimisation measures have been proposed for the other development schemes including re-use and recycle on-site and/or off-site. The residual cumulative effect is considered to be slight adverse.
- 11.5.19 A summary of the potential accumulated effects on each environmental aspect is provided in Table 11.3.

Table 11.3: Summary of Type 2 Cumulative Effects

Discipline	Cumulative Effect	Spatial Extent	Magnitude	Timing/Duration	Mitigation / Enhancement	Uncertainty	Significance of Cumulative Effects
Air Quality	Cumulative air quality impact on sensitive receptors of the DERA Site from construction activities on the DERA Site and the Scheme (in particular dust and construction traffic emissions).	Local	Low	Short-term, during construction only.	Use of appropriate control measures for construction activities as detailed in a CEMP.	Low	Slight Adverse
	Cumulative air quality impact on new residents of the DERA Site from road traffic on the M3.	Local	Low	Long-term	None	Low	Neutral
Noise and Vibration	Cumulative noise and vibration impact on sensitive receptors of the DERA Site from construction activities on the DERA Site and the Scheme.	Local	Low	Short-term, during construction only.	Use of appropriate control measures for construction activities as detailed in a CEMP.	Low	Slight Adverse
	Cumulative noise impact on new residents of the DERA Site from road traffic on the M3.	Local	Low	Long-term	Provision of a low noise surface some time before 2030 as part of on-going maintenance.	Medium	Neutral

Discipline	Cumulative Effect	Spatial Extent	Magnitude	Timing/Duration	Mitigation / Enhancement	Uncertainty	Significance of Cumulative Effects
Landscape and Visual Effects	Additional highway elements (gantries, ERAs) including greater road footprint, combined with additional mixed use infrastructure on the DERA Site contribute to the character and visual influence of expanding urban fringe development into rural areas.	Local	Low to Moderate – depends on receptor.	Short and long term (until mitigation planting establishes and reduces potential impacts).	Landscaping planting	Low	Neutral to Slight Adverse depending on receptor during construction. Neutral during operation.
Cultural Heritage	No cumulative impacts for Cultural Heritage have been identified.						Neutral
Nature Conservation	Cumulative disturbance and pollution effects on Chobham Common may occur from the combined construction activities on the DERA Site and the M3 J2-4a Scheme.	Local	High – SSSI/SPA/SAC conservation area.	Short-term disturbance during construction works.	Use of appropriate control measures for construction activities as detailed in a CEMP.	Low	Slight Adverse
	Cumulative recreational pressure on Chobham Common from the development projects combined with potential pollution from the M3 J2-4a Scheme.	Local	High - SSSI/SPA/SAC conservation area.	Long-term	Provision of SANGs to attract new and existing residents away from Chobham Common.	Low	Slight Adverse
	Cumulative loss of habitat, risk of harm or mortality and disturbance to heathland birds, breeding birds and reptiles may occur from	Local	Moderate – similar construction timescales.	Short-term disturbance during construction works.	Detailed species mitigation strategies, including seasonal constraints and monitoring would be provided in a CEMP,	Low	Neutral

Discipline	Cumulative Effect	Spatial Extent	Magnitude	Timing/Duration	Mitigation / Enhancement	Uncertainty	Significance of Cumulative Effects
	the combined construction activities on the DERA Site and the M3 J2-4a Scheme.				together with recommended best practice habitat creation measures and management regimes.		
	Total loss of habitat from the combined schemes.	Regional	Difficult to assess the combined total area that would be affected as information is unavailable.	Short and long term (until biodiversity enhancement proposals are completed and established).	Provision of SANGs and open spaces, habitat enhancement and creation measures and long-term management planting.	Low	Minor Beneficial
Materials	Cumulative pressure on local landfill facilities for the disposal of inert waste generated by the different schemes.	Regional	Moderate – similar construction timescales.	Short-term during construction.	Waste minimisation strategies including re-use and recycle both on- and off-site.	Low	Slight Adverse

11.6 References

AMEC Environment & Infrastructure UK Ltd, 2012, Princess Royal Barracks, Deepcut, Environmental Statement.

Barton Willmore, 2012a, Former DERA North Site, Longcross, Environmental Statement.

Barton Willmore, 2012b, Land South of Ash Lodge Drive, Ash and Tongham, Environmental Statement.

Capita Symonds, 2012, Wellesley, Aldershot, Environmental Statement.

12. ENVIRONMENTAL MANAGEMENT PLAN

12.1 Introduction

- 12.1.1 This section presents how the likely environmental impacts identified within the assessment are to be linked into the detailed design and then into construction, to ensure that these impacts are managed as the Scheme develops.
- 12.1.2 As described in DMRB Volume 11, Section 2, the function of the Environmental Management Plan (EMP) is primarily to highlight the project commitments to particular environmental designs, mitigation or enhancement measures and/or longer term monitoring, which have been recommended in the assessment. It provides a checklist of the measures and a basis on which monitoring and auditing of the delivery of the environmental performance of the Scheme can be measured.
- 12.1.3 The EMP is presented in Table 12.1 and represents an initial plan that will be further developed and changed as the Scheme progresses through the design process. The EMP will inform the CEMP (Construction Environmental Management Plan) to be produced by the Contractor at the construction stage and eventually the HEMP (Handover Environmental Management Plan) to be passed to the network managing agents at handover.
- 12.1.4 Each identified issue has been given a reference number which can then be used in future plans or activities in order to be clear on which aspect is being addressed. The table also identifies when the mitigation/monitoring activity should occur, i.e.
- During the detailed design stage;
 - Just prior to or during construction; and
 - During operation and maintenance of the Scheme.
- 12.1.5 Certain issues identified have already been addressed in this report and no further analysis or monitoring is required at the next stage or beyond.

Table 12.1 Environmental Management Plan

Reference	Issue	Summary of Proposed Mitigation/ Enhancement Measures	Further Assessment/Survey/Monitoring
Air Quality (AQ)			
AQ01	During construction, potential for changes in air quality due to dust emissions along the route, emissions from site plant equipment and vehicles and also from changes in traffic flows along the Scheme with traffic management in place.	Construction works to be carried out in accordance with best practice. Control measures to minimise dust emissions. Examples are given in paragraph 5.7.2.	Detailed Design: Measures to be specified in CEMP (produced by the Contractor). Construction: Refine CEMP during site works. Operation/Maintenance: Audit of CEMP performance.
AQ02	During operation, potential for changes in air quality due to emissions from operational traffic. 38 receptors are predicted to experience a detrimental change greater than imperceptible, with concentrations anticipated to be greater than the air quality objective for NO ₂ .	Implementation of a 60mph speed limit along a section of the M3, as specified in Section 5.6 until 2019. As the majority of these 38 receptors are located at a level crossing where queuing occurs whilst the barriers are down (around Junction 4), it is proposed that the concentrations of NO ₂ are monitored at this location and mitigation considered if a significant change in NO ₂ is observed with the Scheme.	Operation/Maintenance: Monitor NO ₂ concentrations at the identified location.
Cultural Heritage (CH)			
CH01	Potential to impact the setting of several known heritage assets during construction and/or operation (as detailed in Table 6.8).	Appropriate location of new structures considered at preliminary design stage to reduce visual impacts on known heritage assets, as outlined in Chapter 6 Cultural Heritage and Chapter 7 Landscape. Appropriate landscape mitigation proposed to screen key assets and reduce visual impacts that would affect cultural heritage assets, as outlined in LV02.	See LV02.

Reference	Issue	Summary of Proposed Mitigation/ Enhancement Measures	Further Assessment/Survey/Monitoring
Landscape and Visual Effects (LV)			
LV01	Removal of vegetation within the existing highway boundary during construction in order to install new gantries, Emergency Refuge Areas (ERAs), ducts and chambers.	Consideration of retaining existing vegetation has been included in landscape design proposals to minimise the loss of vegetation during construction. Where vegetation is removed and/or earthworks undertaken, use of appropriate planting to integrate new structures into the M3 corridor landscape character.	<p>Detailed Design: Develop detailed landscape mitigation and construction drawings.</p> <p>Construction: Detailed vegetation survey to be undertaken prior to site clearance, to identify vegetation to be retained alongside works. Monitoring during clearance/construction works to ensure maximum vegetation is retained. Landscape audits to ensure planting establishes.</p> <p>Operation/Maintenance: Undertake maintenance works and check establishment in accordance with a management/maintenance plan. Defects to be addressed.</p>
LV02	Visual impacts and increased influence of the motorway on Landscape Character Areas through intensification of highway infrastructure (introduction of new gantries and CCTV masts, modification of existing signs/gantries) and density of traffic (increased width of traffic to four operational lanes within the highway boundary would increase perception of volume/density of traffic).	Sensitive positioning of respective highway infrastructure elements has been undertaken at preliminary design stage to reduce landscape and visual impacts wherever possible. Landscape design proposals aim to integrate the Scheme into the landscape and screen sensitive receptors through mitigation planting. Use of indigenous species mix, replicating existing species proportions where appropriate to replace removed vegetation as far as possible. Short and long term management of vegetation to achieve mitigation objectives.	<p>Detailed Design: Assess developed detailed design and update landscape mitigation drawings and measures. Ensure planting programme undertaken during optimal planting seasons/conditions.</p> <p>Construction: Undertake site visits and checks during construction to ensure landscape design has been adhered to and that planting establishes.</p> <p>Operation/Maintenance: Undertake maintenance works and check establishment in accordance with a management / maintenance plan. Defects to be addressed.</p>
LV03	Spread of Ash dieback – <i>Chalara fraxinea</i> .	Omission of Ash from specified planting mixes.	Construction: The Contractor and the supply chain to adhere to IAN 172/13 Ash dieback – <i>Chalara fraxinea</i> .

Reference	Issue	Summary of Proposed Mitigation/ Enhancement Measures	Further Assessment/Survey/Monitoring
Nature Conservation (NC)			
NC01	Temporary and permanent land take of verge habitat within the highway boundary in order to install ERAs, gantries, ducts and chambers and temporary and permanent signs.	New infrastructure proposed has been minimised within designated sites at design stage. Temporarily affected areas of verge to be re-instated once works are completed to enable habitats to regenerate naturally. Use of appropriate planting to enhance the ecological value of the soft estate, including re-instating and re-linking severed linear wildlife corridors where required. Short and long term management of vegetation to achieve mitigation objectives.	<p>Detailed Design: Assess developed detailed design and update landscape mitigation drawings and measures to ensure conservation objectives are considered and maintained. Ensure planting programme undertaken during optimal planting seasons/conditions.</p> <p>Construction: Undertake site visits and checks during construction to ensure planting establishes.</p> <p>Operation/Maintenance: Undertake maintenance works and check establishment in accordance with a management / maintenance plan. Defects to be addressed.</p>
NC02	Disturbance and compaction due to vehicle and plant movements causing damage to habitats and potential mortality or injury of reptiles and other fauna.	Construction works to be carried out in accordance to best practice, as detailed in the CEMP. Mitigation measures would include for example: no temporary work compounds or vehicle access routes on the verge adjacent to sections bordering designated sites; use of the hard shoulder to move plant between new infrastructure positions (refer to paragraph 8.6.10 for other examples).	<p>Detailed Design: Mitigation measures to be specified in a site specific CEMP (produced by the Contractor).</p> <p>Construction: Development of the CEMP and update during site works.</p>

Reference	Issue	Summary of Proposed Mitigation/ Enhancement Measures	Further Assessment/Survey/Monitoring
NC03	Potential to encounter and disturb breeding birds during construction.	Vegetation that may be used by breeding birds would preferentially be removed outside of the breeding bird season (March to September). If vegetation clearance is required within the breeding season, an experienced ecologist would need to check areas of vegetation prior to removal. If breeding birds are encountered, the nest site would need to be avoided until it is confirmed by an ecologist that the breeding cycle is complete and that the young have fledged. Monitoring of the nesting locations for sensitive bird species, including Dartford warbler and nightjar, will be undertaken during the breeding bird season by an ecologist and additional safeguards applied to construction activities if necessary.	Detailed Design: Contractor to consider programme of advanced clearance works. Construction: CEMP to include mitigation measures. If vegetation clearance occurs during bird breeding season, supervision by a suitably qualified ecologist to ensure no killing or injury of breeding birds. Monitoring of nesting locations for sensitive bird species to be undertaken by a suitably qualified ecologist during the breeding bird season. Safeguards to be applied if necessary.
NC04	Increased risk of mortality and disturbance to reptiles, including rare reptiles recorded within the verge at Lightwater/Bagshot Heath SSSI, during both construction and operation of the Scheme.	Areas with high reptile potential to be identified to the Contractor. Where reptile potential is identified construction works to be undertaken under the supervision of a suitably qualified ecologist. All trenches and work excavations should be covered overnight to prevent animals falling in, or trenches should include earth ramp to allow animals to climb out.	Detailed Design: To include measures to protect reptiles, for inclusion in the CEMP. Construction: CEMP to include mitigation measures. Ensure supervision of construction activities affecting the verge at identified locations by a suitably qualified ecologist to ensure no killing or injury of reptiles.

Reference	Issue	Summary of Proposed Mitigation/ Enhancement Measures	Further Assessment/Survey/Monitoring
NC05	Construction activities and flood lighting during night works could disturb or prevent bats from using regular commuting routes and/or foraging areas, particularly adjacent to watercourses. Trees and structures identified with low or moderate bat roost potential could have bats roosting in them, which may be affected if works are proposed to them.	Minimise disturbance to bats from the construction activities and, if necessary, construction works to be undertaken under the supervision of a suitability qualified ecologist. Lighting to be controlled through standard Highways Agency good practice. Works to potential roost sites to be supervised by a suitably qualified ecologist.	Detailed Design: To include measures to protect bats, for inclusion in the CEMP. Construction: CEMP to include mitigation measures. If necessary, supervision of night time construction activities by a suitably qualified ecologist.
NC06	300m of Highways Agency verge is within 250m of three ponds supporting Great Crested Newt. Surveys undertaken indicate low population – unlikely to be using verge as foraging area. However, location of a Contractor's construction laydown area at Kitsmead Lane in vicinity of the ponds increases potential to kill or injure individual newts during construction.	Mitigation strategy to be implemented to ensure protection of GCNs. A GCN licence will also be required to ensure GCN are excluded from the Kitsmead Lane lay down area.	Detailed Design: To include measures to protect GCN, for inclusion in the CEMP. Pre-construction: EPS licence to be obtained and to trap GCN from laydown area prior to this site being taken into use. Construction: CEMP to include mitigation measures. If necessary, supervision of construction activities in the vicinity of ponds with identified GCN population by a suitably qualified ecologist to ensure no killing of or injury to GCNs.
NC07	Potential for damage or destruction of badger setts and for individuals to be killed or injured during construction. During operation, increased badger mortality risk due to the proximity of traffic.	Active setts within the physical footprint of the works to be closed (under licence from Natural England, if required) prior to start of construction works. Temporary fencing to be erected at a distance of approximately 20m around active badger setts to prevent construction works causing damage and disturbance to setts. Setts that lie within the vicinity but are not within the physical footprint of the works will be protected through the use of temporary fencing to ensure there is no damage or disturbance as a result	Detailed Design: Sensitive siting of new infrastructure. To include measures to protect badgers including temporary fencing specifications, for inclusion in the CEMP. Pre-construction surveys to determine activity of setts. Obtain licence for closure of badger setts where required. Construction: CEMP to include mitigation measures. If necessary, supervision of construction activities by a suitably qualified ecologist to ensure no killing of or injury to badgers.

Reference	Issue	Summary of Proposed Mitigation/ Enhancement Measures	Further Assessment/Survey/Monitoring
		of construction activity. Mitigation strategy to be implemented to minimise any risk to badgers from construction activities and if necessary construction works to be undertaken under the supervision of a suitably qualified ecologist. All trenches and work excavations to be covered overnight or fenced off to prevent animals falling in, or trenches to include an earth ramp to allow animals to climb out.	
NC08	Construction works for the new gantry proposed within 30m of Cove Brook and for the new chambers in close proximity to Bourne Brook have the potential to affect otters due to potential disturbance to riparian habitat and increased noise and human activity disruption. During operation, increased otter mortality risk due to the proximity of traffic to watercourses and neighbouring riparian habitat at Blackwater River.	Sensitive siting of new infrastructure to reduce impact on riparian habitat at design stage. Otter mortality to be monitored along Blackwater River during and post construction. Mitigation measures to be considered, if mortality rates increase.	Detailed Design: Sensitive siting of new infrastructure away from watercourses. Construction: If necessary, supervision of construction activities by a suitably qualified ecologist for works near watercourses especially Cove Brook, Bourne Brook and Blackwater River. Mitigation measures to be included in the CEMP. Post- Construction: Monitor mortality rates and consider mitigation measures, if required.
NC09	Construction close to watercourses has the potential to disturb water voles, if present.	Sensitive siting of new infrastructure to reduce impact on riparian habitat at preliminary design stage.	Detailed Design: Sensitive siting of new infrastructure away from watercourses. Construction: If necessary, supervision of construction activities by a suitably qualified ecologist for works near watercourses. Mitigation measures to be included in the CEMP.

Reference	Issue	Summary of Proposed Mitigation/ Enhancement Measures	Further Assessment/Survey/Monitoring
NC10	Disturbance to invasive (Japanese knotweed and Himalayan balsam) and non-native plants (sticky fleabane) during construction activities, may lead to the spread of these species, if present.	Appropriate measures will be taken to avoid the spread of invasive plants (including Japanese knotweed and Himalayan balsam). Stands of invasive plants will be fenced off at an appropriate distance. Appropriate measures will also be adopted within the Kitsmead Lane to prevent the spread of the non-native plant sticky fleabane.	Detailed Design: To include measures to spread the spread of invasive and non-native plants, for inclusion in the CEMP. Construction: CEMP to include mitigation measures.
Materials (MT)			
MT01	Impacts associated with the transportation of construction materials; unnecessary imports of primary aggregates and/or fill material and disposal of waste associated with excavation of material.	Primary materials to be sourced locally wherever possible. Excavated material to be re-used on site wherever possible. Site Waste Management Plan (SWMP) to be developed to ensure that waste generation is minimised, materials handling is managed correctly (i.e. separate stockpiling) and all opportunities for re-use and recycling on or off site are identified, with offsite disposal/landfilling being the last resort.	Detailed Design: Mitigation measures to be specified in a site specific CEMP and SWMP (produced by the Contractor). Opportunities for reduction, re-use and recycling to be identified. Construction: Development of the CEMP/SWMP and updates during site works. Operation/Maintenance: Review of CEMP/SWMP performance.
MT02	Potential to encounter contaminated land and materials and subsequent risk to construction/maintenance workers, future site users, infrastructure, controlled waters and project timescales. Widespread contamination is not anticipated for the Scheme.	Contaminated materials would be subject to Waste Acceptance Criteria testing and would require disposal at an appropriately licensed facility. Contaminated material to be separately stockpiled.	Detailed Design: Mitigation measures to be specified in a site specific CEMP and SWMP (produced by the Contractor). Construction: Development of the CEMP/SWMP and updates during site works. Operation/Maintenance: Review of CEMP/SWMP performance.

Reference	Issue	Summary of Proposed Mitigation/ Enhancement Measures	Further Assessment/Survey/Monitoring
MT03	Impacts associated with the annual maintenance regime.	Scheduled maintenance regimes would form part of the contract for on-going maintenance and would ensure efficient use of resources.	Operation/Maintenance: Undertake maintenance works in accordance with a management/maintenance plan.
Noise and Vibration (NV)			
NV01	Noise and vibration disturbance to local residents associated with construction activities. Some 24-hour working likely to be required.	<p>Once the detailed construction schedule is finalised, calculation of noise levels to sensitive receptors will be carried out and mitigation strategies developed. This will require close liaison with the relevant Local Authorities pollution control / environmental health departments.</p> <p>Construction works to be carried out in accordance with best practice (refer to paragraph 10.6.1 for examples).</p> <p>Liaison with EHOs to agree working hours and required mitigation. Section 61 consents to be sought by Contractor.</p> <p>Temporary noise barriers to be provided where existing noise barriers are taken down to facilitate construction works.</p>	Contractor: Revisit noise levels to sensitive, once detailed construction schedule is finalised. Mitigation measures to be specified in CEMP (produced by the Contractor). Section 61 consents to be sought by Contractor. Refine CEMP during site works.
NV02	Increased noise resulting from road traffic along the highway corridor of the Scheme.	16 new noise barriers to be provided to attenuate noise. In addition, one property may qualify for Noise Insulation Regulations. However, the applicability of NIR to schemes of this type is under consideration. Ministerial approval is being sought.	<p>Detailed Design: Preliminary barrier specification to be developed and refined. If NIR is deemed applicable, Detailed Noise Insulation Regulations assessment will have to be undertaken.</p> <p>No further requirement for monitoring at this stage.</p>

13. CONCLUSIONS

13.1 Introduction

- 13.1.1 The Scheme is likely to give rise to a number of moderate and slight adverse environmental impacts which would be required to be managed as the Scheme progresses into detailed design and on through construction. These are summarised below.
- 13.1.2 This Chapter identifies the key environmental issues that have influenced development of the Scheme and highlights the subsequent design and management measures required to avoid significant adverse effects.
- 13.1.3 Based on the findings of this Environmental Assessment Report, a Notice of Determination will be published by the Secretary of State for Transport recording his decision that a Statutory Environmental Statement is not required as the potential environmental impacts can be mitigated through the Scheme design and by standard mitigation measures such that the Scheme would not result in significant environmental effects.
- 13.1.4 A summary of the issues identified and mitigation measures proposed within the Scheme Design are provided below.

13.2 Summary of Potential Effects

- 13.2.1 The key issues for the construction and operation of the Scheme identified from the assessments reported in this document are as follows:
- **Air Quality (Local):** Construction activities are likely to increase dust emissions along the route. This impact will be limited by standard best practice measures. During operation, 38 receptors are likely to experience a detrimental change in air quality due to road traffic emissions, with concentrations anticipated to be perceptibly greater than the air quality objective for NO₂. A 60mph speed limit will be implemented on a section of the M3 between ch 16065-20022 eastbound and ch 16065-20600 westbound (until 2019) and NO₂ concentrations will be monitored in order to limit this impact.
 - **Air Quality (Greenhouse Gases):** The change in carbon emissions resulting from road traffic emissions is estimated at 1,185,232 tonnes.
 - **Cultural Heritage (Construction):** The Scheme would not involve any land-take or intrusive works beyond areas of previously disturbed ground giving rise to few physical impacts upon the cultural heritage resource. Clearance of existing vegetation, would affect the setting of several known heritage assets (as described in Table 6.8), particularly during construction, although the impacts would reduce over time as new planting becomes established.
 - **Cultural Heritage (Operation):** Some receptors, notably the Grade II listed Birch Hall and the Church of St John the Baptist, Grade II* listed Church of St Mary and Thorpe Conservation Area are likely to still experience a longer term slight adverse effect because of the new gantries following mitigation.

- **Landscape Effects (Construction):** Clearance of existing vegetation, which acts as a screen, and the creation of the new earthworks, gantries and signs, would impact on local visual receptors, with the potential to be significant unless mitigation, such as screening junctions and structures with planting were incorporated in the Scheme. Visual receptors include local residents and users of Public Right of Ways in the vicinity of the Scheme. The impacts would be greatest during construction with 7 receptors (32, 42, 43, 78, 83, 91 and 93) experiencing moderate adverse visual effects. However, these effects would reduce over time as new planting becomes established.
- **Landscape Effects (Operation):** Overall, the landscape and visual impacts identified can be limited through mitigation in the form of planting (see mitigation below) and is already heavily influenced by the impact of the existing infrastructure. The Scheme is considered to create no significant residual landscape and visual effects.
- **Nature Conservation:** Installation of new gantries, CCTV masts, ducts and chambers would result in temporary and permanent loss of habitat. Some designated sites would also be affected by disturbance associated with construction activities and pollution effects during construction and operation. Specific mitigation would be provided where the Bourne Brook and Chobham Common are affected. Protected species including Heathland and other breeding birds, reptiles (including rare reptiles found around Bagshot Heath SSSI), otter, Great Crested Newts (GCN), bats, water voles and badgers are present within and adjacent to the highway boundary. Method Statements would be prepared to minimise impacts during construction.
- **Materials:** Import of materials for earthworks and other construction activities would be required. Small amounts of materials from clearance and excavation works may be contaminated and require appropriate treatment. No significant amounts of waste are expected to be generated by a smart motorway scheme.
- **Noise and Vibration (Construction):** Construction works associated with the proposed earthworks and piling activities to install gantries and construct ERAs would result in increased noise and vibration effects on surrounding residential and non-residential sensitive properties.
- **Noise and Vibration (Operation):** Overall, the noise and vibration impacts associated with road traffic can be limited by the installation of 16 noise barriers and is already heavily influenced by the impact of existing traffic.

13.3 Summary of Mitigation and Enhancement Measures

13.3.1 A summary of the mitigation and enhancement measures, including timescales for delivery are provided below.

During Detailed Design

- **Air Quality:** The CEMP developed by the Contractor would detail the good practice measures to be undertaken.
- **Cultural Heritage:** The detailed design, including the landscape mitigation plans, will take into account the setting of cultural heritage assets to ensure visual disturbance is minimised.
- **Landscape:** Landscape design is limited to locations where a new component of the Scheme will be installed to ensure mitigation by screening.

- **Nature Conservation:** The detailed design, including the landscape mitigation plans, will take into account ecological considerations and ensure that habitat loss/protected species disturbance is minimised and that habitats are re-instated and enhanced. Construction method statements for specific protected species would need to be developed for inclusion in the Construction Environmental Management Plan (CEMP), which is to be produced by the Contractor.
- **Materials:** Primary materials to be sourced locally wherever possible. A Site Waste Management Plan (SWMP) is to be developed by the Contractor to ensure that waste generation is minimised, materials handling is managed and all opportunities for re-use and recycling on or off site are identified, with offsite disposal being the last resort. Any contaminated materials encountered would be subject to Waste Acceptance Criteria testing and would require disposal at an appropriately licensed facility, details of which will be specified in the SWMP.
- **Noise and Vibration:** The detailed design would provide the specifications for the proposed 16 noise barriers. The CEMP developed by the Contractor would detail the good practice measures to be undertaken.

During Construction

- **Air Quality:** Construction activities must adhere to CEMP produced. Updates during site works.
- **Cultural Heritage:** None proposed.
- **Landscape:** No additional vegetation clearance to be undertaken without the Client's consent. Existing vegetation would be protected by temporary fencing. Advanced planting prior to construction would be undertaken where possible to minimise effects. Undertake site visits and checks during construction to ensure landscape design is adhered to and planting establishes.
- **Nature Conservation:** Construction activities would follow the CEMP and method statements. An experienced or licensed ecologist would need to be on site in accordance with approved method statements prior to clearance activities being undertaken, in particular if vegetation clearance is to be undertaken during the breeding bird season. Licences to be gained wherever necessary.
- **Materials:** Construction activities must adhere to guidance included in the SWMP produced. Updates during site works.
- **Noise and Vibration:** Construction activities must adhere to CEMP produced. Updates during site works. Where existing noise barriers are removed, they should be replaced with temporary noise barriers.

13.4 Assessment Limitations and Assumptions

13.4.1 The assessment was constrained by:

- The environmental assessment is based on the Scheme design details as available at January 2014 and prior to completion of detailed design. There is potential for some changes to the design to occur, as result of the on-going detailed design process, however any developments in the detailed design must not worsen the impact presented in this report.

- The assessment takes into account mitigation that has been incorporated into the Scheme (e.g. proposed new noise barriers; 60mph speed limit) and assume that standard best practice pollution control measures will be implemented by the Contractor (to be detailed in the CEMP).
- Detailed construction methods were not available to use in this assessment, therefore construction noise impacts have been assessed qualitatively.
- Temporary land take requirements connected to storage and compound areas have not been assessed. The location of such areas will be determined by the Contractor and environmental factors associated with the use of these areas would be managed by the Contractor through a CEMP.
- The assessment assumes that all construction works would be undertaken within the highway boundary and no works or temporary access routes would be required outside of the SRN boundary.

13.5 Next Stage Approach and Assessment

- 13.5.1 It is recommended that the mitigation measures identified in Table 12.1 are taken forward to ensure that all necessary mitigation is captured into the detailed Scheme designs and to ensure that the iterative Environmental Assessment process is applied throughout detailed design and construction.

14. GLOSSARY OF TERMS

Term	Meaning
Annual Average Weekly Traffic (AADT)	It is the total volume of vehicle traffic of a motorway or road for a year divided by 52 weeks.
Active Traffic Management (ATM)	The ATM scheme was piloted on the M42 and was designed to improve traffic flow and reduce congestion. The technology and lesson learned from the ATM Pilot now form the basis for the implementation of Smart Motorways.
Air Quality Standard	The concentration of a pollutant, over a specified period, above which adverse effects on health (or the environment) may occur and which should not be exceeded.
Air Quality Management Area (AQMA)	An Air Quality Management Area (AQMA) is an area of land where air quality levels are breaching the national limits and require action to deal with or 'manage' this. Thus in places where National Air Quality Objectives are not likely to be achieved, the LPAs must declare an Air Quality Management Area.
Appraisal	A process (with methodologies that differ to those of environmental assessment) that looks at the worth of a course of action.
Assessment	A process by which information about effects of a proposed plan, project or intervention is collected, assessed and used to inform decision-making.
Baseline Environment	The environment as it appears (or would appear) immediately prior to the implementation of the project together with any known or foreseeable future changes that will take place before completion of the project.
Best Practice	The undertaking of assessments in line with nationally and internationally recognised assessment guidelines.
Biodiversity	The variety of life forms, the different plants animals and micro-organisms, the genes they contain and the eco-systems they form. Considered at three levels: genetic, species and ecosystem diversity.
Biodiversity Action Plan	Plans that provide actions for targets for the conservation and enhancement of endangered and/or declining species and habitats. Can cover UK, regional or local areas: or the interests of the overseeing organisation.
Catchment	A drainage/basin area within which precipitation drains into a river system and eventually into the sea; or the population region which is served by a city, town, or village.
Compensation	Measures taken to offset or compensate for residual adverse effects that cannot be mitigated, or for which mitigation cannot entirely eliminate.
Construction Environmental Management Plan	Developed prior to any works commencing on site, the primary purpose which is to guide environmental management of implementation of the project, as required by the Overseeing Organisation.
Consultation	A process by which regulatory authorities, statutory and non-statutory bodies are approached for information and opinions regarding a development proposal.
Controlled Motorways	The dynamic management of traffic in the designated running lanes (either in 3 or 4 lane operation using variable mandatory speed limits).
Countryside	The rural environment and its associated communities.
Cultural Heritage	Encompasses the qualities and attributes of places that have aesthetic, historic, scientific or social value for past, present or future generations.

Term	Meaning
Department for the Environment, Food and Rural Affairs	UK Government department with responsibilities for uncultivated land and semi-natural areas in England and Wales.
Desk Study	A review of secondary information/resources i.e. studies of historical maps and written text.
Designations	Notable sites, areas, buildings or structures protected by planning or other laws. Can be applied at Local, Regional and National and International level.
Diversity	Where a variety of qualities or characteristics occurs.
Design Manual for Roads and Bridges	A set of documents that provide a comprehensive manual system which accommodates all current standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads (including motorways).
Diffusion Tubes	Passive gas collection (e.g. NO ₂) devices consisting of a small tube containing a chemical absorbent. Diffusion tubes are used to determine relatively long period average concentrations, typically weekly, fortnightly or monthly.
Dynamic Hard Shoulder Running	The controlled use of the hard shoulder during times of heavy congestion or during incident management.
Effect	Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource.
Emissions Standard	The maximum amount or pollution concentration allowed to be released from a specific source.
Enhancement	A measure that is over and above what is required to mitigate the adverse effects of a project.
Environment	Our physical surroundings, including land, air and water.
Environmental Assessment	A method and a process by which information about environmental effects is collected, assessed and used to inform decision-making. Assessment processes include Strategic Environmental Assessment, Assessment of Implications on European Sites and environmental impact assessment.
Environmental Designation	A defined area which is protected by legislation that is threatened by change from manmade and natural influences e.g. Ramsar sites, Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC).
Environmental Impact Assessment	A statutory process by which certain planned projects must be assessed (EIA) before a formal decision to proceed can be made. Involves the collection and consideration of environmental information, which fulfils the assessment requirements of Directive 85/337/EEC (as amended), including the publication of an Environmental Statement.
Feature	A prominent, eye-catching element.
Gantry	Commonly constructed above high traffic roads, a gantry is a traffic sign and/or signal assembly on which signs/signals are mounted on an overhead support. Gantries in the United Kingdom display exit (junction) numbers, distances to junctions/exits (1 mile, 1/2 mile, 1/4 mile, 1/3 mile, 3/4 mile, 2/3 mile) and destinations reached, and if necessary what lane to use for them.
Geology	The scientific study of the origin, history, and structure of the earth.

Term	Meaning
Habitats Regulations	EC Council Directive 92/43/EEC, known as the Habitats Directive, was transposed in the UK by the Habitats Regulations 1994 (as amended).
Hard Shoulder	A paved strip beside a motorway, usually only used for stopping in emergencies, however it is often used as a running lane in Smart Motorways schemes.
Heritage	Historic or Cultural Associations.
Hydrogeology	The branch of geology that deals with the occurrence, distribution, and effect of ground water.
Impact	Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Improvement	The doing of any act under powers conferred by Part V of the Highways Act 1980 (as amended).
Interface	A point at which independent systems or diverse groups interact, i.e. the meeting of two roads at a junction/roundabout.
LA10,18h	The arithmetic average of the values of L10 hourly dB(A) for each of the eighteen one-hour periods between 0600 to 2400 hours.
Landscape	Human perception of the land contained by knowledge, cultural associations and identity with a place.
Landscape Character	The distinct and recognisable pattern of elements that occur consistently in a particular type of landscape, and how this is perceived by people. Character reflects combinations of geology, landform, soils, vegetation, land use and settlement pattern, inferring a sense of place.
Landscape Character Zone	A landscape type expressing broadly similar physical characteristics, discernible from maps and field surveys.
Legislation	A law or set of laws suggested by a government and made official by a parliament.
Listed Building	A structure which is protected by English Law to protect its architectural and historic interest.
Smart Motorways	Smart Motorways is a 'tool-box' of systems and technologies which facilitates the dynamic control of traffic for congestion and incident management, allowing road space to be managed in different ways for varying conditions to maximise capacity.
Methodology	The specific approach and techniques used for a given study.
Mitigation	Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects.
Mitigation Measures	Methods employed to avoid, reduce, remedy or compensate for significant adverse impacts of development proposals.
Monitoring	A continuing assessment of the performance of the project, including mitigation measures. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted.
Operational	The functioning of a project on completion of construction.
Ordnance Survey	Digital mapping agency of the British Isles.
Perception	The psychology of seeing and attaching value and/or meaning to something.
Phase 1 Habitat Survey	Recognised standard methodology for collating information on the habitat structure of a particular site.

Term	Meaning
Pollution	An increase of matter or energy to a level considered harmful to living organisms or their environment.
Programme	A series of steps that have been identified or series of projects that are linked by dependency.
Receptor	A defined individual environmental feature usually associated with population, fauna and flora that has potential to be affected by a project.
Regulations	Official rules or acts to control something.
Resource	A defined but generally collective environmental feature usually associated with soil, water, air, climatic factors, landscape, material assets, including the architectural and archaeological heritage that has potential to be affected by a project.
Scenario	A picture of a possible future.
Scoping	The process of identifying the issues to be addressed by the environmental impact assessment process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered to be not significant.
Secondary A Aquifers	Permeable layers 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. These are generally aquifers formerly classified as minor aquifers.
Secondary B Aquifers	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Sensitivity	The extent to which the receiving environment can accept and accommodate change without experiencing adverse effects.
Statutory	Related to legislation or prescribed in law or regulation.
Statutory Organisations	Any principal council for the area where the land is situated, Natural England, English Heritage, the Environment Agency; and any other public authority which has environmental responsibilities and which the Secretary of State considers likely to have an interest in the project.
Study Area	The spatial area within which environmental effects are assessed (i.e. extending a distance from the project footprint in which significant environmental effects are anticipated to occur). This may vary between the topic areas.
Technique	A specified working practice.
Traffic Modelling/ Forecasting	The process used to estimate the number of vehicles using a specific section of road or defined network of roads.

15. ABBREVIATIONS

Abbreviation	Meaning
AAWT	Average Annual Weekly Traffic
AB	Acoustic Barrier
ADS	Advanced Directional Signs
AMI	Advanced Motorway Indicator
AQMAs	Air Quality Management Areas
AQSR	Air Quality Standard Regulations
ATM	Active Traffic Management
AQS	Air Quality Strategy
BAP	Biodiversity Action Plan
CAFE	Cleaner Air for Europe
CALR	Continuous All Lane Running
CCDs	Cross Carriageway Ducts
CCTV	Closed Circuit Television
CECs	Combined Equipment Cabinets
CEMP	Construction Environmental Management Plan
ch	Chainage
CM	Continuous Monitor
CROW	Countryside and Rights of Way
CRTN	Calculation of Road Traffic Noise
DfT	Department for Transport
DHS	Dynamic Hard Shoulder
DMRB	Design Manual for Roads and Bridges
DM	Do Minimum
DS	Do Something
DTM	Digital Terrain Model
EAR	Environmental Assessment Report
EA	Environment Agency
EB	Eastbound
EC	European Community
EFT	Emissions Factor Toolkit
EIA	Environmental Impact Assessment
EI	Electrical Interface
EPA	Environmental Protection Act
ERAs	Emergency Refuge Areas
ERTs	Emergency Roadside Telephones
EU	European Union

Abbreviation	Meaning
GLA	Greater London Authority
HABAP	Highways Agency Biodiversity Action Plan
HADECS	Highways Agency Digital Enforcement Camera
HDC	Hart District Council
HER	Historic Environment Record
HGV	Heavy Goods Vehicles
HRA	Hot Rolled Asphalt
HSR	Hard Shoulder Running
IAN	Interim Advice Notes
IEEM	Institute of Ecology and Environmental Management
J	Junction
km	Kilometres
km/h	Kilometres per hour
LAQM TG	Local Air Quality Management Technical Guidance
LCA	Landscape Character Area
LNR	Local Nature Reserve
m	Metres
MAGIC	Multi-Agency Geographic Information for the Countryside
MHS	Maintenance Hard Standing
MIDAS	Motorway Incident Detection and Automatic Signalling
MM	Managed Motorways
MM-ALR	Managed Motorways- All Lanes Running
MMX	Managed Motorway X
MMY	Managed Motorways Y
MP	Marker Post
MPS	Minerals Policy Statement
MS4	Motorway Signals Mark 4
N-deposition	Nitrogen Deposition
NCA	National Character Area
NE	Natural England
NERC	Natural Environment and Rural Communities
NIR	Noise Insulation Regulations
NNR	National Nature Reserves
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
NoD	Notice of Determination
NRTS	National Roads Telecommunication Services

Abbreviation	Meaning
OIR	Options Identification Report
OPDM	Office of the Deputy Prime Minister
OS	Ordnance Survey
PCF	Project Control Framework
PPG	Planning Policy Guidance
PM10	Particulate matter with an aerodynamic diameter of less than 10 micrometres
PTZ	Pan, Tilt and Zoom
RoD	Recommendation of Determination
RBC	Runnymede Borough Council
RmBC	Rushmoor Borough Council
RPG	Registered Park and Garden
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SINC	Site of Importance for Nature Conservation
SHBC	Surrey Heath Borough Council
SGAR	Stage Gate Assessment Review
SM-ALR	Smart Motorway- All Lanes Running
SoS	Secretary of State
SPA	Special Protection Area
SSSIs	Site of Special Scientific Interest
SWMP	Site Waste Management Plan
UK	United Kingdom
UKAQA	United Kingdom Air Quality Archive
UKBAP	United Kingdom Biodiversity Action Plan
UNECE	United Nations Economic Commission for Europe
VMS	Variable Message Signs
VMSL	Variable Mandatory Speed limits
VRS	Vehicle Restraint System
$\mu\text{g}/\text{m}^3$	Microgram per metre cubed
WB	Westbound
WFD	Water Framework Directive
ZVI	Zone of Visual Influence