highways england

M27 Southampton Junctions

PCF Stage 1 – Environmental Study Report

December 2016

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1 INTRODUCTION

1.1 IDENTIFY THE SCHEME AND STAGE OF SCHEME

1.1.1 This Environmental Study Report (ESR) has been prepared by WSP | Parsons Brinckerhoff on behalf of Highways England to help inform the options identification process for the proposed M27 Southampton Junctions scheme. It forms part of the requirements of the Project Control Framework (PCF) Stage 1. The preferred option will be selected during PCF Stage 2, and if the selected option requires a Statutory Environmental Impact Assessment Report (EIAR), it will be prepared during PCF Stage 3.

1.1.2 The M27 Southampton Junctions scheme aims to reduce congestion and improve safety between M27 Junctions 8 and 5 (westbound). It seeks to do this through removing bottlenecks and increasing capacity on the local network along the A3024 corridor in order to encourage traffic to use the shorter, sign-posted routes to the city centre via Junction 8/A3024 rather than via Junction 5/A335.

1.1.3 If traffic congestion is not addressed on the M27 between Junctions 8 and 5, as well as in and around M27 Junction 8, then the service provision along the M27 will deteriorate, and local growth in housing and employment will be stifled.

1.2 LOCATION OF SCHEME

1.2.1 The M27 Southampton Junctions scheme is located in South Hampshire, which is the most urbanised and highly populated area in the South East of England (outside London) and is a key gateway to mainland Europe.

1.2.2 The M27 runs approximately parallel both to the coast of the Solent and to the A27. It starts as an eastwards continuation of the A31 from Bournemouth and Poole, and links to the M271 to central Southampton. After the M271, the road widens to a dual four lane motorway to the junction with the M3, where it narrows to a dual three lane motorway as it passes to the north of Southampton through Junction 5. It is dual four lanes between Junction 7 and 8, and dual three lanes after Junction 8 where it runs alongside the West Coastway Line south-east towards Fareham. It then runs alongside the northern outskirts of Fareham, briefly with a fourth climbing lane in either direction, before its junction with the M275 to Portsmouth.

1.2.3 The local road network consists of the A3024 - Eastern Access Corridor (via Windhover Roundabout), which connects to the M27 at Junction 8, and the A334 which connects to the M27 at Junction 7. Both of these routes provide access towards the Southampton city centre. In the north of the city, the A335 Stoneham Way links to M27 Junction 5 and provides and alternative route into the city centre.

Figure 1-1 Location of M27 Southampton Junctions Scheme

1.3 SCOPE AND CONTENT

1.3.1 For the purpose of assessment and simplicity, the scheme has been sub-divided into five sub-schemes. The regional location of these sub-schemes is shown in **Figure 1-1** (drawing number HE551514/ WSP/ GEN/ M27/ FI/ GIS/0001). The five sub-schemes comprised:

- **Sub-scheme 1**: Capacity upgrades to M27 Junction 8 and the Windhover Roundabout (A27/A3024/A3025);
- **Sub-scheme 2**: Highway network improvements aimed at enhancing traffic movements and capacity for all travel modes along the A3024 Eastern Access Corridor;
- **Sub-scheme 3**: Replacement of the existing A3024 Northam Rail Bridge over the railway in order to widen it from 2 to 4 lanes and increase its structural capacity;
- **Sub-scheme 4**: Widening the existing Wide Lane Bridge under the railway line, located to the north of Swaythling Station, to allow two-way traffic under the bridge and allow right-turn movements onto the A355 Stoneham Way (towards M27 Junction 5) during diversions; and
- **Sub-scheme 5**: Capacity upgrades to the existing Bitterne Rail Bridge to allow a minimum of two full lanes of traffic in the peak direction over the bridge.

1.3.2 In September 2016 Highways England made the decision to remove Sub-scheme 4: Wide Lane Bridge from the scope of assessment. The decision followed a review of the current problems that Sub-scheme 4 may address, and the likely benefits that could be achieved from the approximate £20m sub-scheme cost (based on the "most likely" Stage 0 cost estimate). The reasons for the recommended removal centred on:

- There do not appear to be existing problems with the current diversion route;
- Full closures (resulting in the use of the diversion route) occur less than once per annum;
- The new route that would be facilitated by the scheme is generally more congested during normal operation, and hence represents a worse route than the existing route; and
- There would be no benefits to the day-to-day operation of the local road network.

1.3.3 This ESR[1] therefore considers four sub-schemes and their respective sub-options which are described in **Section 3**.

1.3.4 Commensurate with a PCF[2] Stage 1 assessment, the ESR has been prepared to provide an overview of the environmental constraints and relative environmental benefits associated with the various options. Severe environmental constraints that would preclude further consideration of an option are identified. The ESR also identifies the further assessment that is likely to be required if potentially significant effects are associated with any of the proposed options.

1.3.5 Further monitoring and survey work will be required at a later stage in the design process, in order to close data gaps, and the requirements for this are set out in the topic specific sections of the ESR where they have been identified. It is anticipated that the recommended further survey information will be incorporated into a revised version of the ESR at PCF Stage 2, once the number of options has been reduced and more information is available on the option designs.

[1] Environmental Study Report
[2] Project Control Framework

1.4 STRUCTURE OF THE REPORT

1.4.1 **Sections 1** and **2** of this ESR[3] introduce and describe the scheme; **Section 3** describes the alternatives which have been considered in the assessment; **Section 4** describes the environmental assessment approach including the overall scope and significance criteria used; **Sections 5** to **13** cover the following topics as set out in Highways England; Interim Advice Note (IAN) 125/15[4]; Annex D:

- Air Quality
- Cultural Heritage
- Landscape
- Nature Conservation
- Geology and Soils
- Materials (including Waste)
- Noise and Vibration
- People and Communities; and
- Road Drainage and the Water Environment

1.4.2 **Section 14** provides an outline Construction Environmental Management Plan (CEMP). **Section 15** summarises the findings and conclusions of the ESR.

[3] Environmental Study Report
[4] Interim Advice Note (IAN) 125/15; Highways England; [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

2 THE SCHEME

2.1 BACKGROUND TO THE SCHEME

2.1.1 The Solent to Midlands Route Strategy Study, completed during 2014, was a high-level route assessment and identified long-standing congestion hot spots and safety concerns on the Strategic Road Network (SRN). It confirmed the need for improvement options along the M27 between Junction 8 and Junction 5. Subsequently the M27 Southampton Junctions scheme was included in the Department for Transport's (DfT's) Road Investment Strategy (RIS). The scheme need was confirmed by the Autumn Statement 2014 and through inclusion in RIS 1. It forms part of the Highways England Delivery Plan 2015-2020[5].

2.1.2 This scheme aims, by improving M27 Junction 8 and the A3024 corridor (including the removal of the pinch point over Northam Rail Bridge) to encourage city-centre bound traffic to use the shorter sign-posted routes via M27 Junction 8 /A3024. This in turn will improve traffic flow and reliability on the M27 between Junctions 8 and 5.

2.1.3 The scope of works currently includes:

- Widening of roundabouts at Windhover and Junction 8 to increase capacity and provide new Non-Motorised User (NMU) facilities;
- Replacement of Northam Rail Bridge on the local road network (between Windhover Roundabout and east of Six Dials junction in Southampton) in order to maximise the attractiveness of the eastern access corridor as the preferred route to the Southampton city centre;
- Introduction of active lane management at Bitterne Rail Bridge to remove the bottleneck;
- Making provision for public transport services to reduce local and strategic demand on the eastern access corridor, thereby creating capacity for city-centre bound traffic from M27 Junction 8;
- Collaborating with Southampton City Council (SCC) to make provision for the implementation of a wider local transport strategy to improve accessibility and connectivity and reduce severance for all modes of transport along the A3024 corridor;
- Localised carriageway widening and junction improvements to A3024 corridor.

2.2 REGULATORY FRAMEWORK AND THE SCHEME OBJECTIVES

NATIONAL POLICY

2.2.1 The Government adopted a National Networks National Policy Statement (NN NPS[6]) in December 2014, which sets out the Government's policies to deliver the development of Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in

[5] Highways England Delivery Plan 2015-2020; [online] available at: https://www.gov.uk/government/publications/highways-england-delivery-plan-2015-2020

[6] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks

England. The Secretary of State will use the NN NPS as the primary basis for making decisions on development consent applications for national networks NSIPs in England.

2.2.2 The NN NPS[7]) states that improvements on the highways network are vital to alleviate congestion, particularly in the South East. Paragraph 2.17 states that:

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

2.2.3 The NN NPS[8] indicates that options testing need not be considered by the examining authority or the decision-maker if projects have been subject to full options appraisal in achieving their status within Road or Rail Investment Strategies, or other appropriate policies or investment plans. For national road and rail schemes, proportionate consideration of alternatives will have been undertaken as part of the investment decision-making process.

2.2.4 At PCF[9] Stage 0 it was considered that, due to the majority of the scheme being implemented on the local network, a Development Consent Order (DCO) was unlikely to be required. Therefore, the options are not considered to be an NSIP[10] and will not be subject to the requirements in the NN NPS[11]).

2.2.5 Although the sub-schemes and options are not a NSIP and will not be required to be compliant with the NN NPS[12]), the NN NPS provides useful advice which will be taken into consideration.

OBJECTIVES

2.2.6 The aim of the scheme is to identify changes at M27 Junction 8, Windhover Roundabout and along the A3024 corridor in order to encourage Southampton city-centre bound traffic to use the shorter, sign-posted routes via M27 Junction 8 / A3024 corridor, thereby reducing demand along the M27 between Junction 8 and Junction 5.

2.2.7 Following PCF[13] Stage 1 Value Management Workshops, a set of enhanced strategic objectives was established and is set out below in **Table 2-1** and **Table 2-2**. The primary objectives – aligned with the key Highways England[14] outcomes – are set out in **Table 2-1**, and secondary objectives – linked to the strategic objectives of SCC[15] – are set out in **Table 2-2**. The additional secondary objectives are included due to the scheme falling predominantly on the SCC road network, and SCC's participation in the development of the scheme.

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[7] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[8] National Networks National Policy Statement
[9] Project Control Framework
[10] Nationally Significant Infrastructure Project
[11] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[12] National Networks National Policy Statement (DfT, 2014); [online] available at:https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[13] PCF - Project Control Framework
[14] As set out in the Highways England Strategic Business Plan 2015 to 2020 - https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/396487/141209_Strategic_Business_Plan_Final.pdf
[15] Southampton City Council

2.2.8 The tables describe how implementing the M27 Southampton Junctions scheme will help to achieve the outcomes, and how each objective's success could be measured. These objectives will continue to be developed and refined as the design evolves, both during the course of PCF Stage 2 when more stakeholder requirements are taken into account and once the preferred option is selected, and in subsequent Stages so that measures for achieving objectives are aligned with the Post Opening Project Evaluation (POPE)[16] 1-year and 5-year assessments.

Table 2-1 Primary Transport Objectives and Expected Outcome

Objective	How the scheme will help to achieve the objective	How each objective could be measured
Objective 1: **Supporting economic growth.**	→ Increase traffic capacity across M27 Junction 8 and Windhover Roundabout to facilitate the anticipated consented development growth in Eastleigh. → Release highway capacity along the M27 between Junction 8 and Junction 5, facilitating consented development growth in the region and key movements between the region and the Southampton docks. → Increase highway and sustainable travel capacity along the A3024 corridor and across Northam and Bittern Rail Bridges, unlocking development capacity for the creation of jobs, businesses and housing. → Improve resilience to accommodate capacity demands from committed future developments and to ensure access to South Hampshire's international gateways.	In the 12 months from scheme opening measure for, and compare with compatible data for existing conditions : → Traffic flows and bus passenger movements across M27 Junction 8 and Windhover Roundabout. → The amount of traffic destined for Southampton city centre originating from east of M27 Junction 8 using Junction 5 and the A335 as route, in comparison to the amount of traffic using the A3024. → Traffic flows and bus passenger movements along the A3024 between the M27 and Six Dials junction. → Levels of local employment that could be attributed to the scheme (based upon interviews with the Solent LEP[17]). → Approved local development (linked to available network capacity - based upon interviews with Eastleigh BC and Highways England NDD).
Objective 2: **A safe and serviceable network**	→ Improve safety through reduced conflict between NMU[18]'s and vehicular traffic. → Reduce accident frequency through reduced delays, queuing and driver frustration.	Comparing the five-year period from scheme opening year, with the five years to December 2016, measure: → the total number of accidents, and

[16] POPE – Post Opening Project Evaluation: [online] available at: https://www.gov.uk/government/collections/post-opening-project-evaluation-pope-of-major-schemes
[17] Solent Local Enterprise Partnership
[18] Non-Motorised Users

Objective	How the scheme will help to achieve the objective	How each objective could be measured
	→ Improve the "whole life" safety record at M27 Junction 8 and along the M27 between Junction 8 and Junction 5 due to reduced delays and congestion. → Reduce the requirement for maintenance on Northam Rail Bridge (by designing for maintenance), reducing the exposure of maintenance staff to health and safety risks.	→ the number of accidents involving NMUs Both the above to be measured in accident rate per journey kilometre travelled, and will be measured on the M27 between Junction 8 and Junction 5, as well as along the A3024 corridor, including M27 Junction 8 and Windhover Roundabout. Comparing the five-year period from scheme opening year, with the five years to December 2016, measure maintenance works costs for Northam Rail Bridge.
Objective 3: **A more free flowing network**	→ Reduce congestion and delays along the M27 between Junction 8 and Junction 5, improving journey times for all traffic along the M27. → Reduce congestion and delays on the approaches to M27 Junction 8 and A27 Windhover Roundabout, improving journey times for all traffic routes through the junctions. → Improve capacity resulting in reduced congestion and delays along the A3024 corridor, which will result in a retention of local traffic within the local road network. → Improve capacity at Northam Rail Bridge and Bitterne Rail Bridge, resulting in reduced congestion and delays, reducing the journey times across the bridge sections.	In addition to those set out in ***Objective 1***, in the 12 months from scheme opening measure for, and compare with compatible data for existing conditions: → Average journey times across M27 Junction 8 and Windhover Roundabout for both buses and general traffic. → Average peak hour queue lengths on all approaches to M27 Junction 8 and Windhover Roundabout. → Average journey times along the A3024 corridor between the M27 and Six Dials junction for buses and general traffic. → Average journey times along the M27 between Junction 8 and Junction 5 for general traffic. → Traffic incidents reported to SCC[19] traffic management along the A3024 corridor between the M27 and Six Dials junction.
Objective 4: **An improved environment**	→ Where practicable reduce NO2 levels within Air Quality Management Area (AQMA) No.2 (Bitterne Road West) and the future Southampton Clean Air Zone.	In the 12 months from scheme opening measure for, and compare with compatible data for existing conditions: → Nitrogen dioxide levels at

[19] Southampton City Council

Objective	How the scheme will help to achieve the objective	How each objective could be measured
	→ Where practicable reduce the number of people affected by adverse noise levels within the designated Noise Important Areas along the A3024 corridor and at M27 Junction 8. → Improve the setting of scheduled monuments along the A3024 corridor. → Improve Non-Motorised User (NMU) facilities for users (including footpath and cycleways) at M27 Junction 8 and A27 Windhover Roundabout and at the junctions along the A3024 corridor. → Ensure no net loss of biodiversity.	receptor locations → Noise exposure of the population within the noise important areas → NMU movements at M27 Junction 8, Windhover Roundabout and along and across the A3024 corridor between the M27 and Six Dials junction. Undertake monitoring of habitat improvements at 1 year and 5 years after opening.
Objective 5: **A more accessible and integrated network**	→ Deliver capacity enhancements to the A3024 eastern access corridor, supporting the use of sustainable modes, including buses. → Improve pedestrian and cycle facilities at M27 Junction 8. → Improve pedestrian and cycle facilities at A27 Windhover Roundabout. → Improve safety and NMU[20] facilities at junctions along the A3024 corridor, minimising potential points of conflict between NMU's and vehicular traffic. → Improve NMU facilities at Northam Rail Bridge.	In the 12 months from scheme opening measure for, and compare with compatible data for existing conditions: → Traffic flows along the A3024 corridor between the M27 and Six Dials junction. → Average peak hour queue lengths and delays on all approaches to junctions along the A3024 corridor between the M27 and Six Dials junction. → The number of pedestrians and cyclists using the NMU facilities. → NMU movements at M27 Junction 8, Windhover Roundabout and along and across the A3024 corridor between the M27 and Six Dials junction. → Bus passenger movements across M27 Junction 8, across Windhover Roundabout and along the A3024 between the M27 and Six Dials junction.

[20] Non-Motorised User

Table 2-2 Secondary Transport Objectives (Southampton City Council)

Objective	How the scheme will help to achieve the objective	How each objective could be measured
Objective 6: **Support Southampton City Council in moving forward a wider transport strategy to improve access to and connectivity for all modes with the city centre and along the A3024 corridor**	→ Improve capacity resulting in reduced congestion and delays along the A3024 corridor, which will result in a retention of local traffic within the local road network (Refer to Primary Objective 3). → Improve capacity and optimise signal settings along the A3024, thereby maximising opportunities for local journeys to use sustainable modes (Refer to Primary Objective 5). → Improve safety and NMU[21] facilities at junctions along the A3024 corridor (Refer to Primary Objectives 4 and 5).	Refer to **Table 2-1**
Objective 7: **Support local strategic aims (as set out in the South Hampshire Joint Strategy and Southampton City Council LTP3)**	→ Developing transport improvements that support sustainable economic growth (Refer to Primary Objective 1). → Ensuring reliable access to and from South Hampshire's international gateways for people and freight (Refer to Primary Objective 3), → Optimising the capacity of the highway network and improving journey time reliability for all modes (Refer to Primary Objective 3). → Maintaining or delivering air quality improvements (Refer to Primary Objective 4). → Improving road safety. (Refer to Primary Objective 2).	Refer to **Table 2-1**

[21] Non-Motorised User

2.3 LAND USE SETTING AND LAND TAKE

2.3.1 An overview of the existing land use in the immediate surrounds of the sub-schemes and the proposed land take for the sub-schemes is described below, (see also **Appendix A**).

LAND USE SETTING

- **Land Use: Sub-scheme 1** – Land use in the immediate area of Sub-scheme 1 comprises arable land (generally located to the north and east of Windhover Roundabout). Various light industrial and commercial uses exist in the surrounds (within 500m of the scheme footprint) including, but not limited to; pub/restaurant and accommodation establishments, automotive repair, car/caravan dealerships, a car boot sale market site and a supermarket store. The village of Bursledon is located immediately to the south of Windhover Roundabout.
- **Land Use: Sub-scheme 2** - The A3024 corridor predominately passes through built-up residential, light industrial commercial areas between Windhover Roundabout at the east and up to (but not including) Six Dials junction in the west (approximately 7 km of existing road). The eastern extent of the corridor (east of Hightown approaching the M27 is less urbanised with more rural/agricultural land uses including areas of allotments and public open space. The Sub-scheme 2 alignment follows the existing highways alignments.
- **Land Use: Sub-scheme 3** - Northam Rail Bridge is owned partially by Network Rail and partially by SCC[22], and carries the A3024 over the Brighton Main Line (BML2) and Southampton Eastern Docks Branch (SOY) lines. Adjacent to the north of the bridge are areas of overgrown unused land owned by SCC and Network Rail. Land use to the west of Northam Rail Bridge is predominantly residential, becoming more industrial to the east of the bridge with Shamrock Quay fronting the River Itchen. Immediately south of the bridge is land currently owned by Southern Gas Networks (SGN). Southampton Football Club (which is located approximately 100m to the south) has aspirations to develop this area of land to create a park. Other areas are understood to be on long-term lease to Siemens from Network Rail.
- **Land Use: Sub-scheme 5** –Bitterne Rail Bridge is a Network Rail structure carrying the A3024 over the St Denys Junction to Portcreek Junction (SDP1) rail line. Bitterne Manor Primary School is located adjacent to the south of the bridge. Other land uses in the immediate surrounding area include residential (north and south of the existing structure), light industrial and commercial.

LAND TAKE

2.3.2 The majority of land that would be required for the options is within public ownership of key stakeholders (within the SCC or Hampshire County Council (HCC) highways boundaries or on Network Rail controlled land).

2.3.3 The final extent of all land take (including land take requirements for construction compounds) is not known at the current stage of design.

2.3.4 Identified potential permanent and temporary land take requirements are outlined below.

- **Land Take: Sub-scheme 1** - The options proposed may require permanent or temporary land take in order to accommodate localised widening and retaining walls. Some of the options may require land take as mitigation for impacts on environmental assets.

[22] Southampton City Council

- **Land Take: Sub-scheme 2** – Some of the options proposed would include localised road widening and junction improvements which will require some land take, including potential encroachment on private residential properties and areas of public land (allotments). The extent of land take will be dependent on the ultimate scheme proposals, which will be informed by further traffic modelling assessment.
- **Land Take: Sub-scheme 3** – Land take to the north side of Northam Rail Bridge is required under all option scenarios considered.
- **Land Take: Sub-scheme 5** - Land take to the north and south side of Bitterne Rail Bridge is required if a bridge widening option is pursued.

2.4 CONSTRUCTION, OPERATION AND LONG TERM MANAGEMENT

2.4.1 The construction, operational and long term management arrangements are not known at this stage. Any assumptions made within this assessment relating to the construction, operational or management arrangements are based on prior experience of similar schemes. The anticipated programme allows for design progression and likely third party programme constraints.

2.4.2 The key programme dates are currently anticipated to be:

- Construction Commencement Year: 2020
- Opening Year: 2021
- Forecast Year: 2036 (Traffic/Noise/Air Quality)

2.4.3 For the purposes of assessment during PCF[23] Stage 1, a scheme opening year of 2021 has been assumed, and a forecast design year of 2036. It should be noted that the assumed PCF Stage 6 construction periods for individual sub-schemes vary and, depending on how the implementation of the scheme is procured, the practical completion date of some or all elements of the scheme are likely to be beyond 2021. This will be refined in future stages.

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[23] Project Control Framework

3 ALTERNATIVES UNDER CONSIDERATION

3.1 DESIGN OPTIONS EXAMINED IN PCF STAGE 0

3.1.1 PCF[24] Stage 0 identified the following sub-schemes:

- **Sub-scheme 1:** Capacity upgrades to M27 Junction 8 and the Windhover Roundabout (A27/A3024/A3025);
- **Sub-scheme 2:** A3024 Eastern Corridor:
- **Sub-scheme 3:** A3024 Northam Rail Bridge Replacement; and
- **Sub-scheme 4:** Wide Lane Bridge Widening.

3.2 DESIGN OPTIONS EXAMINED IN PCF STAGE 1

3.2.1 During PCF Stage 0, Bitterne Rail Bridge widening was considered as part of the A3024 Eastern Corridor (Sub-scheme 2). At an early point in PCF Stage 1, following a joint site visit by the project team, Highways England and SCC[25] it was identified as a potential traffic flow pinch point which needed to be addressed as part of Stage 1.

3.2.2 Bitterne Rail Bridge widening was separated out into Sub-scheme 5 in order to allow specific alternative options for this pinch-point to be developed and costed.

3.2.3 As previously indicated (in **Section 1.3.2**) in September 2016 Sub Scheme 4: Wide Lane Bridge was removed from the scope of the scheme by Highways England.

3.2.4 Environmental impact assessment during PCF Stage 1 is normally undertaken on a qualitative basis in accordance with the Design Manual for Road and Bridges (DMRB)[26], and this approach has been followed for the M27 Southampton Junctions scheme.

3.2.5 However, during PCF Stage 1, traffic modelling data was also available that enabled an initial quantitative view of the change in traffic on the network in the scheme study area. This data was used for an initial high level assessment of potential air quality and noise impacts due to the combinations of sub-schemes represented by the Do Something scenario options.

[24] Project Control Framework
[25] Southampton City Council
[26] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

3.2.6 The traffic data was provided from the Sub-Regional Transport Model (SRTM) (managed by Solent Transport) which includes model horizons of 2019 and 2036. As these model horizons are close to the assumed scheme opening year of 2021 and design year of 2036, for the purposes of this initial high level assessment the 2019 and 2036 model horizons data was used, as it was not proportionate to create new horizons in the SRTM for this purpose during PCF Stage 1.

3.2.7 **Appendix A** contains drawings of the sub-options being assessed and **Figure 1-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS - 0001) shows an overview of the sub-scheme locations.

SUB-SCHEME 1: M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

3.2.8 The M27 Junction 8 and Windhover Roundabout options (**Appendix A-1**) aim to increase the capacity of the junctions. The options developed during PCF[27] Stage 1 are:

- **Option 1: Localised Junction Widening**
  - **M27 Junction 8:** Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of NMU[28] facilities (including under M27 Junction 8).
  - **Windhover Roundabout:** Signalisation and localised widening at Windhover Roundabout, and implementation of NMU facilities.
- **Option 2: Through-about to A3024 Bursledon**
  - **M27 Junction 8:** Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of NMU facilities (including under M27 Junction 8).
  - **Windhover Roundabout:** Through-about lane across Windhover Roundabout linking A3024 Bursledon Road to A3024 Bert Betts Way and implementation of NMU facilities.
- **Option 3: Free-flow Left-turn Slip Lanes at M27 Junction 8**
  - **M27 Junction 8:** Dedicated left turning slip-lanes on all approaches.
  - **Windhover Roundabout:** Signalisation and localised widening at Windhover Roundabout, and implementation of NMU facilities.
- **Option 4: Through-about to A3025 Hamble Lane**
  - **M27 Junction 8:** Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of NMU facilities (including under M27 Junction 8).
  - **Windhover Roundabout:** Through-about lane across Windhover Roundabout linking A3025 Hamble Lane to A3024 Bert Betts Way and implementation of NMU facilities.
- **Option 5: Tunnel Under Windhover Roundabout**
  - **M27 Junction 8:** Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of NMU facilities (including under M27 Junction 8).
  - **Windhover Roundabout:** Tunnel under Windhover Roundabout linking A3024 Bursledon Road to A3024 Bert Betts Way and implementation of NMU facilities.

[27] Project Control Framework
[28] Non-Motorised Users

SUB-SCHEME 2: A3024 EASTERN ACCESS CORRIDOR

3.2.9 The section of the A3024 corridor within Sub-scheme 2 extends from the A27 Windhover Roundabout in the west to just east of the Six Dials Junction (A3024/A33 Kingsway / A33 St Andrews Road / New Road) in Southampton. Whilst this extent includes Northam Rail Bridge (Sub-scheme 3) and Bitterne Rail Bridge (Sub-scheme 5), these sections are considered separately under those Sub-schemes.

3.2.10 Three options for increasing capacity and reducing journey times along the A3024 corridor have been identified (see **Appendix A-2**).

3.2.11 The Sub-scheme 2 options developed during PCF[29] Stage 1 are:

- **Level 1: Signal Control Improvements**
  - Urban Traffic Control (UTC) and traffic signal controller reconfiguration at signalised junctions to enable 'gap out' (GO) to eliminate running side roads for longer green times than required. Existing kerb lines and traffic signal infrastructure to be retained. No changes to kerblines are proposed, and no land take is required.
  - Removal of existing bus lanes between Windhover Roundabout and Six Dials.
- **Level 2: Junction and Signal Improvements**
  - Introduction of Urban Traffic Management Control (UTMC) Microprocessor Optimised Vehicle Actuation (MOVA) signal control at signalised junctions with ability to switch to UTC[30] control if conditions require. Minor changes to kerblines at junctions (introducing flares and turning pockets) to improve localised stop-line capacity. Small amounts of localised land take would be required.
  - Removal of existing bus lanes between Windhover Roundabout and Six Dials
- **Level 3: Dualling full A3024 Corridor**
  - As per Level 2, including changes to kerblines and carriageway widening to ensure 2 lanes per direction along the entire A3024 corridor from Windhover Roundabout in the east to Six Dials junction in the west. Land take would be required to facilitate carriageway and junction widening.
  - Removal of existing bus lanes between Windhover Roundabout and Six Dials

3.2.12 The existing bus lanes have been removed with the intention that the proposed options – in combination with the replacement of Northam Rail Bridge (Sub-scheme 3) improve journey times for all modes, including buses.

3.2.13 Further variations may be incorporated as the options are further refined through future stages such as bus priority and/or other measures.

SUB-SCHEME 3: NORTHAM RAIL BRIDGE REPLACEMENT

3.2.14 The Sub-scheme 3 proposal is the replacement of the existing A3024 Northam Rail Bridge with two bridges, upgrading the current single carriageway, single lane per direction crossing with a

[29] Project Control Framework
[30] Urban Traffic Control

dual carriageway, two lane per direction crossing. Previous options for the bridge replacement were developed by Capita Symonds on behalf of SCC[31] in 2010.

3.2.15 Northam Rail Bridge represents a major highway bottleneck on the A3024 due to the road narrowing down from two lanes in each direction to one lane in each direction. As a consequence the flow of traffic westbound along the A3024 corridor is gated during the morning peak *via* the Bitterne Gating System. The gating system limits the flow of traffic across the bridge (in a westbound direction) to within the capacity of the single lane.

3.2.16 The following options (shown in **Appendix A-3**) have been developed in PCF[32] Stage 1:

Option 1 – New bridge / Refurbish Existing Bridge

→ Construct a new two lane bridge and shared footpath/cycleway on the north side of the existing bridge and strengthen the existing bridge to accept two lanes of unrestricted westbound traffic loading. (The headroom below the existing bridge does not meet current design standards and would not be addressed in this option).

Option 2 – New Bridge / Raise and Refurbish Existing Bridge

→ Construct a new two lane bridge and shared footpath/cycleway on the north side of the existing bridge and strengthen the existing bridge to accept two lanes of unrestricted westbound traffic loading. The existing bridge is also to be raised to increase headroom above the tracks below.

Option 3 – New Bridge / New Bridge

→ Construct a new two lane bridge and shared footpath/cycleway on the north side of the existing bridge and demolish and replace the existing structure with a new two lane bridge, including a shared footpath/cycleway on the south side of the replacement structure. Two variations for this option have been developed:

- **Option 3A New Bridge / Demolish and Replace Existing / Close Subway:** removing the subway on eastern side of the bridge and relocating the surface level crossing at the junction of the A3024 Northam Road and Britannia Road. This would require National Cycle Route 23 to be diverted onto the shared footpath/cycleway on the south of Northam Road and across Northam Road at the relocated surface level crossing.
- **Option 3B New Bridge / Demolish and Replace Existing / Retain Subway:** – retaining and extending the existing subway on the eastern side of bridge, leaving the route for National Cycle Route 23 unaffected

SUB-SCHEME 5: BITTERN BRIDGE WIDENING

3.2.17 The proposed sub-scheme is to provide a minimum of 2 lanes per peak direction across the bridge, which is currently narrow and operates as a single wide lane per direction.

3.2.18 The options (shown in **Appendix A-4**) are as follows:

→ **Option 1 – Tidal Flow Gantry System** - This option would install a tidal flow (lane control) system using traffic signals mounted on gantries over the road, and would require no road or bridge widening and no land take. The two current wide lanes would be converted to three standard width lanes, and the lane control system would control the distribution of lanes to

[31] Southampton City Council
[32] Project Control Framework

provide two lanes inbound (westbound) during the morning peak, and the reverse during the afternoon peak.

- **Option 2 – Widening of the Existing Bridge** - This option would widen the existing bridge to provide two full lanes of traffic per direction. The widening is proposed to the north only (minimising land take impact) by means of replacing the edge beams and adding on a widened section to the existing deck. Details are included under Option 1 included in the PCF Stage 1 Structures Options Report for Bitterne Bridge, document reference HE551514-WSP-SGN-PCF1-RP-S-00003-SOR.
- **Option 3 – Replacement (Widening) of the Existing Deck** - This option would widen the existing bridge to provide two full lanes of traffic per direction. However, the option would replace the existing deck, replacing it with a new steel composite deck. The widening would occur to the north only (minimising land take impact). Details are included under Option 2 included in the PCF[33] Stage 1 Structures Options Report for Bitterne Bridge, document reference HE551514-WSP-SGN-PCF1-RP-S-00003-SOR.

3.2.19 **Note** - there is no difference in terms of highways alignment and land take impacts/requirements between Option 2 and Option 3.

3.3 SCENARIO OPTIONS FOR CONSIDERATION IN ENVIRONMENTAL ASSESSMENT

3.3.1 The environmental impacts of sub-schemes options have been assessed individually (i.e. on a sub-scheme level), and in addition a number of combinations of sub-schemes have been assessed as scenario options. These scenario options represent - for the purposes of the environmental, operational and economic assessments - the Do Something options, and have been compared to the Do Minimum.

3.3.2 The scheme appraisal assumes that the M27 Smart Motorway Scheme (Junction 4 to Junction 11) will be in place between Junctions 8 and 5 of the M27 prior to the implementation of any elements of the M27 Southampton Junctions scheme, (see Do Minimum scenario **Table 3-1**). This assumption was agreed with the TAME[34] representative at an early point in Stage 1.

3.3.3 The combinations of sub-scheme options assumed in the Do Something scenario options are as given below. The combination of options assessed in order to identify the "preferred option" will need to be reviewed during PCF Stage 2. During PCF Stage 1 it was not feasible to assess all the potential combinations of options, but the focus was rather to identify and assess a limited number that were considered would provide a representative range of the likely viable, best performing option combinations.

3.3.4 **Do Something 1**: represents the combination of sub-scheme options that would be most likely to achieve the scheme objectives, whilst minimising land take and minimising environmental impacts (based on qualitative information available at the mid-point of PCF Stage 1). These combinations had to be decided upon prior to all the assessments as input to the strategic modelling.

- Do Something 1 includes for localised widening at M27 Junction 8 and Windhover Roundabout (Sub-scheme 1 - Option 1), and for the dualling of the A3024 corridor (Sub-scheme 2 - Level 3). It includes for the replacement of Northam Rail Bridge (Sub-scheme 3 -

[33] Project Control Framework
[34] TAME – Traffic Appraisal Modelling and Economics

Option 3A), and assumes that that the tidal flow system is implemented at Bitterne Rail Bridge, i.e. the bridge is not widened (Sub-scheme 5 - Option 1).

- Option 1 was included for Sub-scheme 1 on the basis of it being the most likely design to be implemented, having been developed in some detail by HCC[35] (and shown to represent high value for money) prior to inclusion in the M27 Southampton Junctions scheme. Individual sub-scheme options for Sub-scheme 1 may represent a worse environmental impact (e.g. Option 5, which includes for tunnelling under Windhover Roundabout), and these are assessed in detail at a sub-scheme level.
- This scenario option would - based on preliminary traffic modelling evidence - represent the largest increase in traffic flows along the A3024 corridor, and was used to represent the "worst case" in environmental terms based on the risks regarding air quality and noise impacts identified during PCF Stage 0.

3.3.5 **Do Something 2**: represents the combination of sub-schemes that minimises land take along the A3024 corridor (with the exception of Northam Rail Bridge).

- Do Something 2 is the same as Do Something 1 with the exception that the A3024 corridor would not be dualled, and only minimal intervention in terms of traffic signal control implemented (Sub-scheme 2 - Level 1).
- This option represents a lower cost option that - subject to traffic modelling assessment - may provide a similar benefit to Do Something 1, and allows for comparison of the benefits / value for money between Do Something 1 and Do Something 2.

3.3.6 **Do Something 3**: represents a reduced scope scheme including only for Sub-scheme 1, based on historic evidence of this sub-scheme's viability. This option would have an impact on the rest of the A3024 corridor as it would address existing congestion issues at M27 Junction 8 and Windhover Roundabout.

3.3.7 A high level assessment has therefore been made based on combinations of the sub-scheme options (Do Minimum, Do Something 1, Do Something 2, Do Something 3) shown in **Table 3-1** below.

[35] Hampshire County Council

Table 3-1 Do Minimum/Do Something Scenarios Considered

Sub Scheme	Option Considered for Scenario
Do Minimum - Smart Motorways without Scheme	
Sub-scheme 1	N/A
Sub-scheme 2	N/A
Sub-scheme 3	N/A
Sub-scheme 5	N/A
Do Something 1 - Dualling of A3024 Corridor	
Sub-scheme 1	Option 1
Sub-scheme 2	Level 3
Sub-scheme 3	Option 3A
Sub-scheme 5	Option 1
Do Something 2 - Signalised Junction Improvements of A3024 Corridor	
Sub-scheme 1	Option 1
Sub-scheme 2	Level 1
Sub-scheme 3	Option 3A
Sub-scheme 5	Option 1
Do Something 3 - Sub-scheme 1 Only	
Sub-scheme 1	Option 1
Sub-scheme 2	N/A
Sub-scheme 3	N/A
Sub-scheme 5	N/A

4 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY ASSUMPTIONS MADE

4.1 GENERAL APPROACH

4.1.1 This report follows the assessment approach set out in the DMRB[36] Volume 11 and relevant IANs (including IAN 125/15[37]). Sections 1 and 2 of the DMRB describe the approach for Simple and Detailed Assessment and IAN 125/15 sets out the topic structure for ESRs[38].

4.1.2 For the purposes of assessment during PCF[39] Stage 1, a scheme opening year of 2021 has been assumed, and a forecast design year of 2036. It should be noted that the assumed PCF Stage 6 construction periods for individual sub-schemes vary and, depending on how the implementation of the scheme is procured, the practical completion date of some or all elements of the scheme are likely to be beyond 2021. This will be refined in future stages.

4.2 BASELINE TRAFFIC FLOWS

4.2.1 Traffic modelling flows considered as the "baseline traffic flow data" in the environmental assessment (particularly Sections dealing with effects on Noise and Vibration, Air Quality and Nature Conservation) were made available in August/September 2016 and are based upon the initial (Phase 1) datasets from the SRTM[40], (managed by Solent Transport). Due to the absence of a Do Minimum scenario with Smart Motorways in the Phase 1 modelling datasets, the "without Smart Motorways" datasets were used as a proxy input for the purposes of the environmental assessment at PCF Stage 1. The Phase 2 datasets from the SRTM were only available in mid-October 2016 which did not allow for their application to the PCF Stage 1 environmental assessment.

4.2.2 The traffic data provided from the SRTM includes model horizons of 2019 and 2036. As these model horizons are close to the assumed scheme opening year of 2021 and design year of 2036, for the purposes of this initial high level assessment the 2019 and 2036 model horizons data was used, as it was not proportionate to create new horizons in the SRTM for this purpose during PCF Stage 1.

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[36] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[37] Interim Advice Note (IAN); Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm
[38] Environmental Study Reports
[39] Project Control Framework
[40] Sub-Regional Transport Model

4.3 SCOPING

4.3.1 An informal scoping exercise was undertaken as part of PCF[41] Stage 1 to determine the level of assessment that was appropriate at this early stage in the design process. The level of assessment and proposed approach for each topic is summarised in **Table 4-1.**

4.3.2 As this ESR[42] has been undertaken to support early design work all topics have been scoped into this assessment at this stage. This is discussed further within **Section 15** of this ESR.

4.3.3 Simple assessments were proposed to provide proportionate assessments for the large number of options, and in view of the limited design information available.

Table 4-1 Environmental Topics and Level of Assessment

Topic	Level of Assessment
Air Quality	Simple Assessment. High level preliminary assessment based on DMRB[43], Volume 11, Section 3, Part 1 Air Quality, May 2007; IAN 174/13[44] Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA 207/07); and the Institute for Air Quality Management (IAQM), Guidance on the Assessment of dust from demolition and construction, January 2014. Use of baseline traffic flow data has informed the assessment.
Cultural Heritage	Simple Assessment. High level preliminary assessment based on Historic England guidance, Historic Environment Good Practice Advice in Planning Note 3 (Historic England 2015); the Cultural Heritage Section (Volume 11, Section 3, Part 2) of the DMRB (Highways Agency, 2007); Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Historic Environment Desk-based Assessment (2014) and CIfA Code of Conduct (2014) [45].
Landscape	Simple Assessment Based on IAN 135/10[46] Landscape and Visual Effects Assessment (Highways Agency 2010); the Guidelines for Landscape and Visual Impact Assessment (GLVIA) (3rd Edition) (Guidelines for Landscape and Visual Impact Assessment (GLVIA), 2013); and the Landscape Effects Section

[41] Project Control Framework
[42] Environmental Study Report
[43] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[44] Interim Advice Note (IAN) 174/13; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm
[45] Chartered Institute for Archaeologists Regulations Standards and Guidelines; [online] available at: http://www.archaeologists.net/codes/cifa
[46] Interim Advice Note (IAN) 135/10; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

Topic	Level of Assessment
	(Volume 11, Section 3, Part 5) of the DMRB (Highways Agency, 2007).
Ecology and Nature Conservation	Simple Assessment. Based on the guidelines for Ecological Impact Assessment (EcIA) produced by the Chartered Institute of Ecology and Environmental Management (CIEEM) (2016); and the Ecology and Nature Conservation Section (Volume 11, Section 3, Part 4) of the DMRB (Highways Agency, (2007). Use of baseline traffic flow data has informed the assessment).
Geology and Soils	Simple Assessment. High level assessment based on DMRB Volume 11, Section 3, Part 11 Geology and Soils, (June 1993); CIRIA C552; (2001): Contaminated Land Risk Assessment – A Guide to Good Practice.
Materials	Simple Assessment High level assessment based on IAN 153/11[47] (Highways Agency, 2011) on the environmental assessment of material resources.
Noise and Vibration	Simple Assessment High level assessment of construction phase noise and vibration impacts in accordance with British Standards: BS5228 1 and 2; Code of practice for noise and vibration control on construction and open sites; (2008); and qualitative assessment of operational phase impacts following guidance in DMRB[48]. Use of baseline traffic flow data has informed the assessment.
People and Communities	Simple Assessment High level assessment based on the approach in IAN 125/15[49], which combines DMRB Volume 11, Section 3, Parts 6 (Land Use), 8 (Pedestrians, Cyclists, Equestrians and Community Effects) and 9 (Vehicle Travellers) into one assessment of People and Communities. The published guidance for these topics has been used.
Road Drainage and the Water Environment	Simple Assessment High level assessment based on DMRB Volume 11, Section 3, Part 10 (HD 45/09).

[47] Interim Advice Note (IAN) 153/11; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm
[48] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[49] Interim Advice Note (IAN) 125/15; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

4.4 SIGNIFICANCE CRITERIA

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

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

4.4.3 The overall significance of effects was assessed using the matrix in DMRB Volume 11, Section 2, Part 5 (reproduced at **Table 4-2**). This approach to assessing significance is used throughout the assessments, unless specified in the topics.

Table 4-2 Arriving at the Significance of Effects

		MAGNITUDE OF IMPACT (DEGREE OF CHANGE)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
ENVIRONMENTAL VALUE (SENSITIVITY)	**Very High**	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

4.5 MITIGATION/ENHANCEMENT

4.5.1 Mitigation is defined as ‘measures intended to avoid, reduce and, where feasible, remedy significant adverse environmental effects’ (DMRB[50] Volume 11, Section 1, Part 7 (HA 218/08)). Enhancement measures are defined as 'measures over and above normal mitigation' (IAN 125/15[51]).

4.5.2 Some initial mitigation and enhancement measures have been identified in the topic sections. However, further measures will be considered at a later stage in the design process, once further design information is available.

[50] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[51] Interim Advice Note (IAN)125/15; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

5 AIR QUALITY

5.1 INTRODUCTION

5.1.1 This section presents a qualitative air quality assessment of the Sub-schemes and Sub-scheme Options taking account of the available scheme information and existing baseline conditions. The assessment ranks the three Do Something Scenario Options from best to worst in terms of receptor exposure to pollutants.

5.2 ASSESSMENT METHODOLOGY

5.2.1 The existing baseline air quality conditions have been determined by a review of available information published by SCC[52], Test Valley Borough Council (TVBC), and the Department for Environment, Food and Rural Affairs (Defra).

5.2.2 At this stage, a high level qualitative assessment is appropriate for the construction phase, commensurate with DMRB[53] HA 207/07 'Scoping' level of detail. The assessment considers potential emissions from construction plant and vehicles, dust arising from construction activities, and the impacts on sensitive receptors within 200m of the proposed construction work - particularly those at existing residential receptors and designated sites.

5.2.3 For the operational phase, a semi-quantitative air quality assessment was undertaken. Although some preliminary traffic data has been extracted from the SRTM[54], it was not possible to undertake a fully quantitative air quality assessment or conduct a Compliance Risk Assessment, as the available data is insufficient. At PCF[55] Stages 2 and 3, sufficient traffic data should be available to undertake a more quantitative assessment to consider the study area defined in accordance with the methodology set out in DMRB HA 207/07.

5.2.4 The assessment has:

- Taken account for the sensitivity of sensitive receptors within 200m of each option alignment, with commentary of potential air quality impacts with regard to changes in source proximity and likely changes in traffic characteristics;
- Ranked scheme options according to potential air quality benefits; and
- Highlighted any risks that become apparent along with potential mitigation.

5.2.5 It has not been possible to determine significance of effects at this stage, and all findings in this section should be considered preliminary.

5.3 STUDY AREA

5.3.1 The following section sets out the study area for this assessment, and gives an indication of the potential study area for the future assessment during Stage 2, as set in HA 207/07 based on the current design information (see **Appendix A**). The HA 207/07 methodology considers the

[52] Southampton City Council
[53] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[54] Sub-Regional Transport Model
[55] Project Control Framework

physical extent of the works and any associated traffic links that are predicted to be affected by the introduction of the scheme.

5.3.2 The study area for construction impacts is limited to the maximum known extent of work for all of the options as shown in **Figure 5-1** (Drawing Reference HE551514 – WSP – GEN - M27 – FI – GIS - 0005) with impacts considered out to 200m from the maximum likely extent of the scheme. At this stage of the assessment there is no data available about potential construction related traffic impacts.

5.3.3 With regards to the predicted operational impacts, the DMRB[56] methodology sets the following criteria for determining significant traffic links[57] to help define the extent of the study area:

- Road alignment will change by 5m or more;
- Daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more;
- Heavy Duty Vehicle flows will change by 200 AADT or more;
- Daily average speed will change by 10km/hr or more; and
- Peak hour speed will change by 20km/hr or more.

5.3.4 The preliminary traffic data provided was extracted from the SRTM[58] and has been used as an indication of potential effects. More extensive traffic data will be available at the next stage of assessment to inform a more definitive study area. The links triggering the criteria in the current preliminary traffic data are identified in **Figure 5-1** (Drawing Reference HE551514 – WSP – GEN - M27 – FI – GIS - 0005) and have been summarised below.

5.3.5 The following links form the operational study area:

- M27 from the west of Nursling through to the east past Swanwick;
- M3 from the M27 to north of Chandlers Ford;
- M271;
- A335 from Charlotte Place in Southampton city centre up to Eastleigh;
- A35/A33 from Totton through to Kingsway A3024 junction;
- A27 from the junction with A335 going east past Swanwick;
- A3025 from the Itchen Toll Bridge through to the Windhover Roundabout; and
- Dodwell lane/B3033 and B3036 going north of Junctions 7 and 8 of the M27.

5.3.6 As indicated in DMRB HA 207/07, air quality impacts beyond 200m of road construction sites and operational road sources are unlikely to be significant.

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[56] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[57] Traffic data is provided as vehicle flows over a segment of road (usually between junctions) named a traffic link.
[58] Sub-Regional Transport Model

Figure 5-1 Study Area of Links Triggering DMRB Criteria in Preliminary Traffic Data

5.4 BASELINE CONDITIONS

SCC: LOCAL AIR QUALITY MANAGEMENT

5.4.1 SCC[59] has declared 10 AQMA's[60] within the City of Southampton. All of SCC's AQMA's are designated due to exceedances of the Government's Air Quality Strategy (AQS) objective for annual mean nitrogen dioxide[61] (NO_2); the primary contributor to this comes from nitrogen oxides (NO_x) emissions from road vehicle exhausts.

5.4.2 In 2014, diffusion tube monitoring recorded concentrations of NO_2 between 34.6 micrograms per cubic metres (µg/m^3) and 39.5µg/m^3 within the Bitterne/Northam Road AQMA. Sub-schemes 2 and 5 are located within the Bitterne/Northam Road AQMA. The preliminary traffic impacts indicate that the wider traffic impacts as a result of the scheme options may also be experienced in the following AQMA's:

- Redbridge/Millbrook Road AQMA
- Town Quay AQMA
- Bevois Valley AQMA

5.4.3 SCC undertakes air quality monitoring. Most of the monitoring sites are roadside NO_2 diffusion tubes located within and around the city centre. SCC has several continuous automatic analysers currently in operation, including CM1, CM4 and CM6.

5.4.4 CM1 is located in an urban centre location and monitors NO_2, PM_{10} (particulates of 10 micrometres diameter or less), $PM_{2.5}$, (particulates of 2.5 micrometres diameter or less), as well as a range of other pollutants which will not be considered within this assessment. CM4 is located in a roadside location on Onslow Road and CM6 is located in a roadside location on Victoria Road. Both CM4 and CM6 monitor concentrations of NO_2.

5.4.5 The nearest monitoring site to Sub-schemes 1 and 2 is a roadside location named Bitterne Air Quality Monitoring Station (AMS) (SCC ref: N137), located approximately 4.5km and 2.2km north west of Sub-schemes 1 and 2 respectively. In 2014 the annual mean NO_2 concentration monitored at this site was 36µg/m^3. This represents an increase from previous years (since 2010). The average NO_2 concentration from 2010-2013 was 33.2µg/m^3. The nearest monitoring location which represents residential exposure is located across the A3024, approximately 25m to the south of Bitterne AMS.

5.4.6 The nearest monitoring site to Sub-scheme 3 is an urban centre location on Brinton's Road (Brinton's Road 1, Brinton's Road 2 and Brinton's Road 3) (SCC ref: N110, N111 and N112), located approximately 215m to the west of Sub-scheme 3. In 2014 the annual mean NO_2 concentration monitored at this site was 29.2µg/m^3. This concentration is similar to those of the previous three years, although no clear long-term trend is apparent. The highest concentration within this period was 32.3µg/m^3, monitored in 2010.

5.4.7 The nearest monitoring site to Sub-scheme 5 is a roadside location approximately 300m to the west of the scheme at 81 Bitterne Road West (SCC ref: N108). There is no data available for this site for 2014 as it had not been deployed at that time. However, the data can be used to define the baseline using the more recent 2015 data.

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[59] Southampton City Council
[60] Air Quality Management Area
[61] The AQS objective for annual mean NO_2 is 40µg/m^3 (this is numerically the same as the EU Limit Value for annual mean NO_2).).)

TEST VALLEY DISTRICT COUNCIL: LOCAL AIR QUALITY MANAGEMENT

5.4.8 To date, TVBC[62] has not identified any AQMA's[63] in its administrative area. The most recent monitoring data has not identified any potential areas which may exceed air quality objectives.

5.4.9 TVBC does not currently operate any automatic monitoring sites. Non-automatic monitoring undertaken in 2014 comprised 17 NO_2 diffusion tubes positioned at selected kerbside, roadside, intermediate and urban background locations. In 2014, the tubes measured concentrations between 13.8µg/m^3 and 35.0µg/m^3.

EASTLEIGH DISTRICT COUNCIL

5.4.10 Eastleigh Borough Council has declared three AQMAs within their borough. Analysis of the preliminary traffic data indicates that traffic impacts may be seen within the Eastleigh and the M3 AQMAs. Both have been declared for breach of the objective for annual mean nitrogen dioxide.

DEFRA: POLLUTION CLIMATE MAPPING

5.4.11 The area around Southampton, including the areas where the four Sub-schemes are located, is included within the Southampton Urban Area (UK0091) for Defra[64] reporting of compliance with EU limit values for air quality. The latest report for 2014 indicates non-compliance with the limit value for annual mean NO_2 (40µg/m^3) and compliance with all other limit values[65]. The evidence supporting compliance is provided by UK statutory monitoring networks and supplemented by Pollution Climate Mapping (PCM) modelling.

5.4.12 PCM data are available for 2014 from the Defra UK Air website[66] as a shapefile of road links and associated roadside and background concentrations of NO_X and NO_2. All four sub–schemes are located on PCM links, with the data indicating roadside annual mean NO_2 concentrations along the scheme in the range of 29 – 39 µg/m^3 (just below the EU limit value). This is illustrated in **Figure 5-1** (Drawing Reference: HE551514 - WSP - GEN - M27 - FI - GIS - 0005) and **Figure 5-2** (Drawing Reference: HE551514-WSP-GEN-M27-FI-GIS-0002). On the wider network within Southampton, roadside annual mean NO_2 concentrations range between 23 - 63 µg/m^3.

DEFRA: BACKGROUND CONCENTRATION MAPPING

5.4.13 Defra provides estimates of background annual mean pollutant concentrations across the country on a 1 by 1 km grid[67]. The highest background concentrations tend to occur in grid squares with the greatest density of sources, such as urban areas, and including the SRN[68]. Background concentrations of NO_2, NO_x and Particulate matter (PM_{10} and $PM_{2.5}$) in 2014 are illustrated in **Figure 5-2** (Drawing Reference: HE551514-WSP-GEN-M27-FI-GIS-0002) and **Figure 5-3** (Drawing Reference: HE551514-WSP-GEN-M27-FI-GIS-0003) for NO_2 and NO_x respectively as summarised in **Table 5-1**.

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[62] Test Valley Borough Council
[63] Air Quality Management Area
[64] Department for Environment, Food and Rural Affairs
[65] Defra, Air Pollution in the UK 2014 – Compliance Assessment Summary (http://uk-air.defra.gov.uk/library/annualreport/index)
[66] [online] available at: http://uk-air.defra.gov.uk/data/gis-mapping
[67] Web reference https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013
[68] Strategic Road Network

Table 5-1 Summary of Background Concentrations (µg/m^3) within the Southampton Urban Area

Year		Nitrogen Dioxide NO_2	Nitrogen Oxide NO_x	Particulate Matter PM_{10}	Particulate Matter $PM_{2.5}$
2014	Min	9.9	14.3	12.3	9.0
	Max	41.3	75.9	19.8	13.9

Figure 5-2 2014 Background Concentrations of NO_2,

Figure 5-3 2014 Background Concentrations of NO_x

5.5 REGULATORY AND POLICY FRAMEWORK

RELEVANT LEGISLATION

5.5.1 UK legislation includes regulations defining limit values, objectives and targets for a range of pollutants. These criteria are set to protect public health and sensitive vegetation/ecosystems. The relevant criteria are set out in **Table 5-2**. There are currently no criteria for dust and nitrogen deposition rates.

5.5.2 The Air Quality (England) Regulations 2000 (No. 928) set air quality objectives for local authorities[69]. These objectives are included in the current AQS[70], which was first established by the Government in 1997 in accordance with the requirements of Part IV of the Environment Act 1995[71]. The Environment Act also introduced the system of Local Air Quality Management (LAQM) in pursuit of achieving the air quality objectives (commonly referred to as 'AQS objectives'). Local authorities are responsible for LAQM and are required to regularly review and assess local air quality and report to Defra. Where a local authority identifies non-compliance with one or more AQS objectives it is required to declare an AQMA[72] and produce an Air Quality Action Plan (AQAP) to work towards achieving the relevant AQS objective(s).

Table 5-2 Relevant Air Quality Criteria

Pollutant	Concentration ($\mu g/m^3$)	Measured as …	Number of Exceedances Allowed in a Calendar Year
NO_2	40	Annual mean	None
	200	1-hour mean	No more than 18
NO_x	30	Annual mean	None
PM_{10}	40	Annual mean	None
	50	24-hour mean	No more than 35
$PM_{2.5}$	25	Annual mean	None

5.5.3 The Air Quality Standards Regulations 2010 No.1001 set EU limit and target values for pollutants[73]. Whilst numerically the same in terms of concentration statistics as the air quality objectives within the Air Quality (England) Regulations 2000, the compliance with the EU limit values for pollutants is mandatory and this is ultimately the responsibility of the Secretary of State. Failure to comply will result in infraction proceedings by the EU with potentially a very substantial financial penalty. These regulations are therefore very important when considering improvements to the strategic road network, including this scheme.

[69] [online] available at: http://www.legislation.gov.uk/uksi/2000/928/contents/made
[70] Air Quality Strategy
[71] [online] available at: http://www.legislation.gov.uk/ukpga/1995/25/contents
[72] Air Quality Management Area
[73] [online] available at: http://www.legislation.gov.uk/uksi/2010/1001/contents/made

RELEVANT POLICY

NATIONAL PLANNING POLICY FRAMEWORK

5.5.4 In relation to local air quality, the National Planning Policy Framework (NPPF)[74] states (para. 124) that

"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 impacts 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."

5.5.5 For the Sub-scheme options, this statement implies that with AQMAs being affected by the scheme, the scheme should be consistent with the local AQAP[75].

THE NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS

5.5.6 The NN NPS[76]) (DfT[77], 2014) makes reference to air quality and requires all schemes with the potential to affect air quality to undertake an air quality assessment that describes baseline air quality and future air quality with and without the proposed scheme.

5.5.7 The NN NPS states that air quality considerations are likely to be particularly relevant where schemes are proposed in areas where there are existing exceedances of air quality objectives or EU limit values, or sites designated for nature conservation. Moreover the policy states that scheme will not be consented where they adversely impact on compliance with the 2008 EU Air Quality Directive.

5.5.8 At a local level the air quality policy is currently detailed in the Local Plan Policy (LPP) Sustainability Development Principles (SDP) 15[78]. This document states:

5.5.9 "Planning permission will be refused where the effect of the proposal would contribute significantly to exceeding the National Air Quality Strategy Standards or where the proposal would be materially affected by existing and continuous poor air quality. Large potentially polluting developments will be required to assess their air quality impact by detailed air dispersion modelling and appropriate monitoring."

5.5.10 The assessment will follow all the relevant policy outlined above.

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[74] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2
[75] Air Quality Action Plan
[76] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[77] Department for Transport
[78] Southampton City Council; Local Plan Policy (LPP) Sustainability Development Principles (SDP) 15: [online] available at: https://www.southampton.gov.uk/planning/air-quality-planning/sdp15.aspx

5.6 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

MITIGATION

CONSTRUCTION PHASE

5.6.1 Since the locations and arrangements for construction compounds and laydown areas have not been identified at this PCF[79] stage, the following is a preliminary assessment using currently available information. It has not been possible at this stage to devise detailed site specific mitigation measures and the associated monitoring studies to test their effectiveness.

5.6.2 Appropriate measures to mitigate emissions from construction works area that account for the sensitivities of adjacent off-site locations will be incorporated within the CEMP[80]. Particular care will be required when planning and implementing measures to minimise fugitive dust emissions from site areas adjacent to existing residential dwellings.

OPERATIONAL PHASE

5.6.3 Projected PCM[81] data indicates that roadside annual mean NO_2 concentrations in 2020 are generally below 32 µg/m^3 and are considered unlikely to exceed the annual mean objective for NO_2. The only exception is on the A35 (CensusID 73615) on the Redbridge flyover where the projected roadside concentration is 39 µg/m^3 and is considered at risk of exceeding the EU limit value of 40 µg/m^3. Whilst preliminary traffic modelling predicts an increase in 2019 (the approximated scheme opening year) further study is required to provide a more robust answer in terms of air quality, as this may be a result of an anomaly within the strategic model.

5.6.4 Generally, a scheme design that minimises occurrence of traffic congestion will support improvements in ambient air quality. This is aided by future year improvements with progressive replacement of older, more polluting vehicle technologies with those that are less polluting will bring about improvements in ambient air quality. However, significant improvements are unlikely to be possible if traffic congestion relief leads to an increase in capacity. With the scheme's design aiming to reduce congestion but increase capacity and flow along the A3024 corridor - releasing demand elsewhere on the network - significant adverse impacts on air quality may occur, including those associated with roads passing through an AQMA.

5.6.5 Air Quality Monitoring will be undertaken at PCF[82] Stage 2 to determine annual mean NO_2 concentrations in the vicinity of the four sub-schemes. The survey would be 12 months in length at selected sensitive areas across the four schemes and would complement local council monitoring in the area. The results will be used to inform the air quality assessment at subsequent PCF stages.

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[79] Project Control Framework
[80] Construction Environmental Management Plan
[81] Pollution Climate Mapping
[82] Project Control Framework

5.7 OVERALL ASSESSMENT

CONSTRUCTION PHASE

5.7.1 Due to the early stage in the design of the options, there is very little information about proposed construction methodologies. Therefore, the assessment focuses mainly on potential construction and earthworks, as the need for demolition is currently unknown as well as identifying any potential sensitive receptors.

5.7.2 The air quality impacts of construction are generally restricted to the duration of the works. They relate to particulate matter emissions and any loss of amenity as a result of the construction.

5.7.3 **Table 5-3** to **Table 5-6** provide qualitative comments on likely magnitude of effects of each sub-scheme and options within each sub-scheme.

Table 5-3 Assessment of Construction Impacts at Sub-scheme 1 – M27 Junction 8 and Windhover Roundabout Upgrades

	Option 1 - Localised Junction Widening		Option 2 - Through-about to A3024 Bursledon		Option 3 - Free-flow Left-turn Slip Lanes at M27 Junction 8		Option 4 - Through-about to A3025 Hamble Lane		Option 5 - Tunnel Under Windhover Roundabout	
	M27 Junction 8	Windhover Roundabout	M27 Junction 8	Windhover Roundabout	M27 Junction 8	Windhover Roundabout	M27 Junction 8	Windhover Roundabout	M27 Junction 8	Windhover Roundabout
Element	Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of Non-Motorised Users (NMU)[83] facilities (including under M27 Junction 8).	Signalisation and localised widening at Windhover Roundabout, and implementation of Non-Motorised Users (NMU) facilities.	Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of Non-Motorised Users (NMU) facilities (including under M27 Junction 8).	Through-about lane across Windhover Roundabout linking A3024 Bursledon Road to A3024 Bert Betts Way and implementation of Non-Motorised Users (NMU) facilities.	Dedicated left turning slip-lanes on all approaches.	Signalisation and localised widening at Windhover Roundabout, and implementation of Non-Motorised Users (NMU) facilities.	Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of Non-Motorised Users (NMU) facilities (including under M27 Junction 8).	Through-about lane across Windhover Roundabout linking A3025 Hamble Lane to A3024 Bert Betts Way and implementation of Non-Motorised Users (NMU) facilities.	Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of Non-Motorised Users (NMU) facilities (including under M27 Junction 8).	Tunnel under Windhover Roundabout linking A3024 Bursledon Road to A3024 Bert Betts Way and implementation of Non-Motorised Users (NMU) facilities.
Receptor Sensitivity	Closest residential properties lie within 80m of the sub-scheme. Most of the residential properties are located to the south and south east of the sub-scheme along Windmill Lane and between the A3025 and A27 to the south. A small number of properties lie to the north of the sub-scheme along of the A27.									
Scale of Construction	Small	Small	Small	Medium	Small	Small	Small	Medium	Small	Large
Comments	Most of the options considered are of a small scale involving localised road widening. Option 2 and 4 involve construction of through lanes across the roundabout these will involve more construction work as the works would be of a longer duration and additional construction sites. The tunnel proposed in Option 5 would involve the greatest construction work, and therefore have the greatest impact, as there would considerable excavation and associated works adjacent to the sub-scheme. The least impact will be on Option 1, with Option 3 having a slightly larger impact due to the construction of a new slip lane. No significant effects during construction are predicted on any European protected sites (see **Section 8.4.2**) The likely impacts of the options will be largely negligible / minor adverse this is due to the relatively low number of receptors close to the sub-scheme and the distance of the receptors to the sub-scheme.									

[83] Non-Motorised Users

Table 5-4 Assessment of Construction Impacts at Sub-scheme 2 – A3024 Eastern Access Corridor

	Level 1 - Signal Control Improvements	Level 2 - Junction and Signal Improvements	Level 3 - Dualling full A3024 Corridor
Element	UTC[84] and traffic signal controller reconfiguration at signalised junctions to enable GO[85] to eliminate running side roads for longer green times than required. Existing kerb lines and traffic signal infrastructure to be retained. No change to kerblines. Removal of bus lanes between Windhover Roundabout and Six Dials Junction.	Introduction of UTMC[86] MOVA[87] signal control at signalised junctions with ability to switch to UTC control if conditions require. Minor changes to kerblines at junctions (introducing flares and turning pockets) to improve localised stop-line capacity. Removal of bus lanes between Windhover Roundabout and Six Dials Junction.	As per Level 2, including changes to kerblines and carriageway widening to ensure 2 lanes per direction along the entire A3024 corridor from Windhover Roundabout in the east to Six Dials junction in the west. Removal of bus lanes between Windhover Roundabout and Six Dials Junction.
Receptor Sensitivity	A large number of residential properties along the whole extent of the sub-scheme with some < 10m from the roadside. Bitterne Junior School and Springwell School are also within 200m of the sub-scheme.	A large number of residential properties along the whole extent of the sub-scheme with some < 10m from the roadside. Bittern Junior School and Spring well School are also within 200m of the sub-scheme.	A large number of residential properties along the whole extent of the sub-scheme with some < 10m from the roadside. Bitterne Junior School and Springwell School are also within 200m of the sub-scheme.
Scale of Construction	Negligible	Small	Medium
Comment	There are no anticipated impacts from construction as it predominantly signalling changes	The impact of construction phase activities is likely to be negligible due to the small scale of construction	The impact of construction phase activities is likely to be negligible at these receptors, providing appropriate mitigation is implemented.

[84] Urban Traffic Control
[85] Gap Out
[86] Traffic Management Control
[87] Microprocessor Optimised Vehicle Actuation

Table 5-5 Assessment of Construction Impacts at Sub-scheme 3 – Northam Rail Bridge Replacement

	Option 1 - New bridge / Refurbish Existing Bridge	Option 2 - New Bridge / Raise and Refurbish Existing Bridge	Option 3A - New Bridge / Raise and Refurbish Existing Bridge	Option 3B - New Bridge / Demolish and Replace Existing / Retain Subway
Element	Construct new two lane bridge and footpath cycleway on the north side of the existing bridge and strengthen the existing bridge to accept two lanes of unrestricted traffic. The headroom below the existing bridge does not meet current design standards.	Construct new two lane bridge and footpath cycleway on the north side of the existing bridge and strengthen the existing bridge to accept two lanes of unrestricted traffic. The existing bridge is also to be raised to increase headroom above the tracks below.	Construct new two lane bridge and footpath cycleway on the north side of the existing bridge and demolish and replace the existing structure - removing subway on eastern side of bridge and replacing with surface level crossing.	Construct new two lane bridge and footpath cycleway on the north side of the existing bridge and demolish and replace the existing structure - retaining subway on eastern side of bridge.
Receptor Sensitivity	Large number of residential properties receptors with the closest being 30m from the sub-scheme.			
Scale of Construction	Medium	Medium	Large	Large
Comment	Proposed construction likely to be relatively contained within the constraints of the available land and the potential for using precast segments for the bridge with little earthworks. The impact of the construction phase activities is likely to be largest for Options 3A and 3B due to the demolition of the existing bridge, with little differentiating Options 1 and 2 at this stage.			

Table 5-6 Assessment of Construction Impacts at Sub-scheme 5 – Bitterne Rail Bridge Widening

	Option 1 - Tidal Flow Gantry System	Option 2 - Widening of the Existing Bridge	Option 3 - Replacement (Widening) of the Existing Deck
Element	Install tidal flow lane control system (no road or bridge widening)	Widen the existing bridge to the north only by means of replacing the edge beams and cantilever of widened sections of existing deck.	Widen the existing bridge to the north only by means of replacing the existing deck with a new steel composite deck
Receptor Sensitivity	Large number of residential properties receptors with the closest being 30m from the sub-scheme.		
Scale of Construction	Small	Medium	Large
Comment	Proposed construction likely to be relatively contained within the constraints of the available land and the potential for using precast segments for the bridge. The impact of the construction phase activities is likely to be largest for Option 3, with Option 1 the smallest impact.		

OPERATIONAL PHASE

5.7.4 Whilst the construction assessment considered all sub-schemes and their associated options, traffic data is only available for the Do Something Scenario options described in **Table 3-1**. Therefore, for the operational assessment qualitative assessment was undertaken based on a comparison of the sub-scheme options.

5.7.5 With the assessment being at an early stage the traffic data can only be used as an indication of predicted impacts. The assessment identifies all links which are predicted to trigger the DMRB[88] criteria. It is not possible to quantify the predicted impacts on residential receptors at this time; however the Do Something Scenario Options are likely to have an effect across Southampton. The assessment considers the impacts at sensitive areas, namely at AQMAs[89] and PCM[90] links predicted to exceed the EU limit value in 2020. These impacts are summarised in **Table 5-7** and **Table 5-8** below. Impacts are rated as whether they have an adverse (X) or positive (✓) impact, larger impacts are shown as double crosses.

Table 5-7 Predicted Impacts on AQMAs

AQMA	DS1	DS2	DS3	Comments
Southampton Council				
Bitterne Road / Northam Road	X X	X X	-	DS1 – Large increase in flows predicted in 2019 and 2036 DS2 – Large increase in flows predicted in 2019 and 2036
Bevois Valley	✓	-	X	DS1 – Decrease in flows predicted in 2019 and 2036 DS2 – No change in flows predicted

[88] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[89] Air Quality Management Areas
[90] Pollution Climate Mapping

AQMA	DS1	DS2	DS3	Comments
				DS3 – Increase in flows in 2019 (St Andrews Rd)
Town Quay	X	X	X / ✓	DS1 – Increase in flows predicted in 2019 and 2036 DS2 – Increase in flows predicted in 2019 DS3 – Increase in flows predicted, decrease in HGV flows (Terminus Terrace)
Redbridge Rd /Millbrook Rd	X	X	X	DS1 – Increase in flows predicted in 2019 and 2036 DS2 – Increase in flows predicted in 2019 DS3 - Increase predicted in 2019
Eastleigh Borough Council				
M3	✓	✓	✓	All scenarios- Decrease predicted in 2019 up to J13
A335	✓	✓	✓	All scenarios - Decrease predicted in 2019

5.7.6 The physical presence of the sub-schemes in the Bitterne Road/Northam Road AQMA means that impacts as a result of the scheme are inevitable. With the scheme's design aiming to reduce congestion but increase capacity and flow along the A3024 corridor - releasing demand elsewhere on the network – the impacts are likely to be adverse. Further out, the impacts are likely to vary as a result of rerouting Southampton city-centre bound traffic from the M27 to the shorter, sign posted route via M27 Junction 8 and the A3024 corridor. Generally, impacts within the AQMAs in Southampton are expected to be adverse with traffic increases predicted in the preliminary traffic model. Decreases in traffic are predicted in the Eastleigh AQMAs namely the M3 and A335.

5.7.7 The PCM[91] link projections for 2020 for the Southampton area indicate that link 73615 (Redbridge flyover) see **Figure 5-1 (**Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS - 0005) is at risk of exceeding the EU limit value in 2020, with or without the scheme options. Therefore, any increase in traffic on this link may increase the risk of exceedance of the EU limit value. However, this cannot be confirmed until the traffic modelling is refined in a future stage.

Table 5-8 Affected PCM Links

PCM Link	DS1	DS2	DS3	Comment
73615	X	X	X	All scenarios are expected to have a similar increase in flows for 2020.

5.7.8 A qualitative comparison of the modelled scenario options, and the sub-scheme options not directly modelled, is made in **Table 5-9**. All sub-schemes are assessed individually.

Table 5-9 Qualitative Assessment of Non-modelled Options

Sub-schemes	Options	Do Something Scenario	Impact	Comment
Sub-scheme 1: M27 Junction 8 and Windhover	Option 1	1 / 2 / 3	Minor Adverse	The increase in capacity provided by the option design will allow more traffic to flow through the junction during the peak periods.
	Option 2	Not modelled	Minor Adverse	The increase in capacity provided by the option design will allow more traffic to flow

[91] Pollution Climate Mapping

Sub-schemes	Options	Do Something Scenario	Impact	Comment
Roundabout Upgrades				through the junction during the peak periods.
	Option 3	Not modelled	Minor Adverse	The increase in capacity provided by the option design will allow more traffic to flow through the junction during the peak periods.
	Option 4	Not modelled	Minor Adverse	The increase in capacity provided by the option design will allow more traffic to flow through the junction during the peak periods.
	Option 5	Not modelled	Minor Adverse	The increase in capacity provided by the option design will allow more traffic to flow through the junction during the peak periods.
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1	2	Major Adverse	Sub-scheme located within the Bitterne Rd AQMA. Changes to traffic signal equipment at junctions will have less of an impact on flows than Levels 2 and 3, but will result in an increase in traffic flow along the A3024 corridor.
	Level 2	Not modelled	Major Adverse	Sub-scheme located within the Bitterne Rd AQMA. Will result in a slightly higher increase in flows along the A3024 corridor compared to Level 1.
	Level 3	1	Major Adverse	Sub-scheme located within the Bitterne Rd AQMA. Will result in the largest increase in flows along the A3024 corridor (compared to Level 1 and 2).
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1	Not modelled	Minor Adverse	All options would provide the same amount of additional capacity and would result in the same increase in flows.
	Option 2	Not modelled	Minor Adverse	
	Option 3A	1 / 2	Minor Adverse	
	Option 3B	Not modelled	Minor Adverse	
Sub-scheme 5: Bittern Bridge Widening	Option 1	1 / 2	Major Adverse	Sub-scheme located within the Bitterne Rd AQMA. Tidal flow control system would provide increased capacity in the peak direction and would result in an increase in traffic flows across the bridge.
	Option 2	Not modelled	Major Adverse	Sub-scheme located within the Bitterne Rd AQMA. Both options involve widening of the bridge which would allow for two full lanes per direction, increasing the capacity and resulting in an increase in flows which would likely be larger than the increase for Option 1.
	Option 3	Not modelled	Major Adverse	

QUANTITATIVE ANALYSIS OF TRAFFIC DATA – REGIONAL ASSESSMENT

5.7.9 This section describes an initial analysis of the potential total emissions, using the preliminary traffic generated from the SRTM[92] for the three Do Something Scenario Options described in **Table 3-1**. Whilst the previous section assessed the sub-schemes individually, the likelihood is

[92] Sub-Regional Transport Model

that a combination of the sub-schemes would be implemented. The assessment below considers the 3 combinations identified to be assessed during PCF[93] Stage 1.

5.7.10 The metric used for this assessment is the total mass of pollutant emitted by all vehicles which use each road within the modelled network. The analysis considered total vehicle-distance travelled (as a combination of AADT[94] and link length) through each link, and made use of the emission factors within Highways England IAN185/15[95]. An analysis of the total pollutant emitted on each link which triggers the DMRB[96] criteria, compared to a "do minimum" scenario. By comparing the total mass of pollutant (NOx) (tonnes per annum), an indication of the impact of the scheme at a regional level can be drawn. A negative number represents a net decrease in total emissions.

5.7.11 **Table 5-10** summarises the findings of the regional assessment for all three Do Something Scenario Options in 2019 and 2036. The results show that with the preliminary traffic data, the Do Something 3 scenario option is the most beneficial in 2019 and the Do Something 1 scenario option is the least beneficial. All Do Something Scenario Options are seen to have an increase in total emissions in 2036.

Table 5-10 Regional Assessment of Do Something Scenario Options of NOx in Tonnes per Annum

Do Something Scenario	2019	2036	Comment
DS1	-3570	5807	Least beneficial in opening year
DS2	-4555	4971	Moderate beneficial in opening year
DS3	-5711	1111	Most beneficial in opening year

5.7.12 The scheme's aim is to reduce congestion but increase capacity and flow along the A3024 corridor - releasing demand elsewhere on the network. This is reflected by the preliminary traffic model flows across the network. The increase in flows can result in significant increases in pollutant concentrations within several AQMAs. Principally in the Bitterne Road AQMA, which Sub-schemes 2 and 5 pass through, but also further out on the Redbridge Road/Millbrook Road and Town Quay AQMA.

5.7.13 Several PCM[97] links have been identified by Defra within the Southampton urban area. Of these, one link (Redbridge flyover) is projected to be at risk of exceedance of the EU limit value in 2020, irrespective of whether this scheme goes ahead or not. Therefore any potential increase in flows as a result of the scheme in the opening year may lead to an exceedance of the EU limit value.

SUMMARY

5.7.14 A summary of the potential effects relating to the sub-scheme options is included in **Table 5-11** below.

5.7.15 The impacts of construction are largely negligible; this is because the construction dust assessment aims to mitigate any adverse impacts during the design phase. Where there are

[93] Project Control Framework
[94] Annual Average Daily Traffic
[95] Interim Advice Note (IAN) 185/15; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm
[96] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[97] Pollution Climate Mapping

minor adverse impacts, there is currently no mitigation suggested, since there is insufficient information surrounding the construction methodology at this stage.

5.7.16 The aim of the scheme is to reduce congestion and increase traffic flows along the A3024 corridor. Therefore, all schemes result in, at least, a minor adverse impact. This is due to the increase in mass of pollutant released, arising from an increase in traffic flows, overcoming the reduction in vehicle emission rates from congestion improvements. Major adverse impacts are expected at as a result of Sub-schemes 2 and 5 located within the Bitterne Road AQMA.

Table 5-11 Summary of Impacts

Sub-schemes	Options	Impact	
		Construction [1]	Operation
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades	Option 1	Negligible	Minor Adverse
	Option 2	Negligible	Minor Adverse
	Option 3	Negligible	Minor Adverse
	Option 4	Negligible	Minor Adverse
	Option 5	Minor Adverse	Minor Adverse
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1	Negligible	Major Adverse
	Level 2	Negligible	Major Adverse
	Level 3	Negligible	Major Adverse
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1	Minor Adverse	Minor Adverse
	Option 2	Minor Adverse	Minor Adverse
	Option 3A	Minor Adverse	Minor Adverse
	Option 3B	Minor Adverse	Minor Adverse
Sub-scheme 5: Bittern Bridge Widening	Option 1	Negligible	Major Adverse
	Option 2	Negligible	Major Adverse
	Option 3	Minor Adverse	Major Adverse
[1] Impacts after appropriate mitigation measures are implemented as part of CEMP[98]			

5.8 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

5.8.1 At this early stage of the assessment, the extent of the traffic model was insufficient to adequately define the study area. The current preliminary model has links that trigger the DMRB[99] criteria at the periphery of the extended study area. The study area will therefore have to be extended until no significant impacts are detected as per the DMRB HA207/07 criteria. It is possible that impacts will need to be considered over a much wider area due to changes in traffic with the scheme in place.

5.8.2 Without detailed traffic modelling data, it has not been possible to quantify the detailed air quality impacts resulting from the sub-scheme options and determine whether or not these are likely to give rise to a significant effect, particularly at the AQMAs in and around Southampton.

[98] Construction Environmental Management Plan
[99] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

5.8.3 The full extent of the affected road network, and the determination of any significant effect, will be undertaken at the subsequent PCF[100] stage when the required traffic data is available, in accordance with DMRB HA 207/07 procedure. The Stage 2 datasets from the SRTM[101] were only available in mid-October 2016 which precludes the application to the PCF Stage 1 environmental assessment.

5.8.4 At this stage in the design process the location of construction compounds is not known. As the design progresses into PCF Stage 2 and 3, and construction compound locations become known, further assessment will be undertaken to determine the environmental impacts associated with their establishment, location, and construction phase activities.

[100] Project Control Framework
[101] Sub-Regional Transport Model

6 CULTURAL HERITAGE

6.1 INTRODUCTION

6.1.1 This section sets out the preliminary environmental assessment of the scheme in respect of Cultural Heritage. Cultural Heritage encompasses the three sub-topics, of Archaeological Remains, Historic Buildings and Historic Landscape. For the purposes of this assessment Historic Landscapes are not applicable due to close proximity of the scheme to the existing highways boundary. Features of these sub-topics are referred to as heritage assets. These are outlined below:

- Archaeological remains are defined within the DMRB[102] as 'the material (e.g. artefacts, field monuments, structures and landscape features) created or modified by human activities that contribute to the study and understanding of past human societies and behaviour;
- Historic Buildings are described with the DMRB as 'architectural or designed or other structures with significant historical value';
- Cultural heritage also comprises the settings of the heritage assets, which can be considered to be the surroundings within which they are located.

6.2 ASSESSMENT METHODOLOGY

DATA COLLECTION

6.2.1 The principal sources of information consulted were historical and modern maps, although published and unpublished secondary sources were also reviewed. The following sources were consulted during the data-gathering process:

- The Historic Environment Record (HER) held by SCC[103] and HCC[104].
- National Heritage List for England (NHLE)

TERMINOLOGY

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

[102] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[103] Southampton City Council
[104] Hampshire County Council

STANDARDS AND GUIDANCE

6.2.3 In addition to Historic England guidance and DMRB, this assessment has been written in compliance with the NPPF[105] and in accordance with the following relevant professional guidelines: CIfA[106] Standard and Guidance for Historic Environment Desk-based Assessment (2014); CIfA Code of Conduct (2014); and Historic England (2015) Management of Research Projects in the Historic Environment (MoRPHE).

SENSITIVITY OR IMPORTANCE OF THE ASSET

6.2.4 For the two relevant cultural heritage sub-topics (Archaeological Remains and Historic Buildings), an assessment of the value of the heritage assets within the study areas has be undertaken on a five-point scale of Very High, High, Medium Low, Negligible and Unknown according to the criteria provided in the DMRB[107] Table 5.1 and Table 6.1.

6.3 STUDY AREA

6.3.1 The data sources in **Section 6.2.1** have been used to determine the presence of all types of heritage assets within an inner study of 200m which is considered sufficient in order to provide an essential historic and archaeological contextual background for the scheme. In order to determine the potential for archaeological remains within the footprint of the scheme it is also necessary to understand the archaeological context of the wider area, which could extend to up to 5km.

6.3.2 A 500m study area was applied for consideration of impacts upon setting for designated heritage assets only; comprising World Heritage Sites, Scheduled Monuments, Listed Buildings, Registered Historic Parks and Gardens. This study area is considered to be sufficient due to the low lying nature of the proposed scheme and the built up character of the urban environment in which it is set.

6.4 BASELINE CONDITIONS

6.4.1 There are no World Heritage Sites or sites included on the Tentative List of Future Nominations for World Heritage Sites (July 2014), Registered Historic Parks and Gardens, Registered Battlefields or Conservation Areas within 500m of any of the Sub-scheme corridors.

SUB SCHEME 1 - M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

RECEPTORS

6.4.2 Through evaluation of the baseline information presented above, key receptors have been identified as shown in **Table 6-1** below:

[105] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2
[106] Chartered Institute for Archaeologists
[107] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

Table 6-1 Key Heritage Asset Receptors for Sub-Scheme 1

Heritage Asset Type	Asset Name	Value of Receptor
Grade II* Listed Buildings and their settings	Bursledon Windmill (1281479)	High
Grade II Listed Buildings and their settings	Dodwell Cottage (1111965), Granary to south of Hiltonbury Farmhouse (111940)	High
Potential below-ground/surface archaeological remains	Potential archaeological remains from the Prehistoric (500,000 – AD 43), Romano-British (AD 43 – AD 410) and Early Medieval (AD 410 – AD 1066) Periods.	Unknown

HISTORIC BUILDINGS

6.4.3 There are no listed buildings within the maximum extent of Sub-scheme 1. However, there are three listed buildings within the 500m study area for Sub-scheme 1 (**Table 6-1**). These assets are presented on **Figure 6-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0009).

POTENTIAL FOR PREVIOUSLY UNRECORDED ARCHAEOLOGY TO BE PRESENT

6.4.4 There are no known below-ground heritage assets within the inner 200m study area of Sub-scheme 1. There are assets in the wider study area. Prehistoric activity has been identified in the form of a Bronze Age barrow cemetery located 1km to the northwest of Sub-scheme 1.

6.4.5 Romano-British occupation and activity is indicated by the site of Bitterne (Clausentum) Roman station approximately 4km to the northwest of the Sub-scheme and the Roman road between Bitterne and Chichester approximately 1km to the north of the Sub-scheme.

6.4.6 Anglo-Saxon activity is evidenced by the site of the Anglo-Saxon settlement of *Hamwic* 5km to the west, and the site of an Anglo-Saxon cemetery at Bitterne Manor which is located 5 km to the north-west of the Sub-scheme**.**

Figure 6-1 Designated Asset Location Plan (All Sub-Schemes)

6.4.7 SUB SCHEME 2 - A3024 EASTERN ACCESS CORRIDOR

RECEPTORS

6.4.8 Through evaluation of the baseline information, the key receptors have been identified in **Table 6-2**.

Table 6-2 Key Heritage Asset Receptors for Sub Scheme 2

Heritage Asset Type	Asset name	Value
Scheduled Monuments and their settings	Bitterne (Clausentum) Roman station (SM1005538) and Roman piers and revetment in the River Itchen (SM1425731)	High
Grade II Listed Buildings and their settings	Church of St Augustine (1339987), Bitterne Manor (117845) , Church of the Holy Saviour (1339965), 1 Vespasian Road (1091984), St Mary's Hall76 St Mary's Street (1393939), Lamp standard in centre of paved area at western end of Bevois Street (1178432), Site of St Mary's Drill Hall (1431467), No 33 Palmerston Road (1179004), No 32 Palmerston Road (1339991), Nos 30 and 31 Palmerston Road (1092031) and No 2 New Road (1092025)	High
Locally Listed Buildings and their settings	90 Northam Road (DSH435), 92 Northam Road (DSH436), Cobbett Road Library (DSH483), 88 Northam Road (DSH434), Gasholder Station (DSH408) 86 Northam Road (DSH526), 216 to 238 and 238A Northam Road (DSH437), 51 and 53 Northam Road (DSH427), 84 Northam Road (DSH433), 82 Northam Road (DSH432), 80 Northam Road (DSH431), 78 Northam Road (DSH430), 74 to 76 Northam Road (DSH429), 72 Northam Road (DSH428), Northam Primary School Community Centre and "House by the School", (DSH416),2 Northam Road (DSH426), St Matthews Church (DSH449), St Mary's School, Ascupart Street (DSH370) 120 St Mary Street (DSH455), Argyle Centre (DSH369) Britannia Court (Flats 1 to 18), Britannia Road (DSH407), 128 St Mary's Road (DSH450), James Street Evangelical Church (DSH494), Plumes of Feathers Public House, 73 St Mary Street (DSH453) 135 St Mary Street (DSH456) 141 St Mary Street (DSH457), Adam of "Adam and Eve" sculptures (DSH484) and Eve of "Adam and Eve" sculptures (DSH485)	Medium
Non-designated historical buildings	Anderson air raid shelter (MSH5682), a late 19th century public house, previously known as the Glebe Hotel (MSH3492), the Prince of Wales Public House (MSH5045), 216 to 238 and 238A Northam Road (MSH3502) and 60, 62 and 64 West End Road (MSH3872), 208a to 214 Northam Road (MSH3811), Southampton Gas Holder Station in Britannia Road - Gas Holder No.9 (MSH459) and Bitterne Station (MSH5711).	Low
Known and potential buried/surface archaeological	Known and potential archaeological remains, particularly from the Prehistoric (500,000 – AD 43), Romano-British (AD 43 – AD 410), Early Medieval (AD 410 – AD 1066), Late Medieval (AD 1066-1750)	Low-High

Heritage Asset Type	Asset name	Value
remains	and Industrial (c.1750 – 1901) Periods LAAP[108] 8, 11, 12 and 16	

6.4.9 Designated Assets are shown in **Figure 6-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0009) above. Non Designated Assets are shown in **Figure 6-2** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0008) below.

SCHEDULED MONUMENTS

6.4.10 There are no Scheduled Monuments within the Sub-scheme boundary. There are two Scheduled Monuments within the 500m study area (Bitterne (Clausentum) Roman station and Roman piers and revetment in the River Itchen). These are located either side of the A3204 at Bitterne Manor. The location of these assets is presented on **Figure 6-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0009).

HISTORIC BUILDINGS

6.4.11 There are no listed or locally listed historic buildings within the Sub-scheme boundary. However, there are ten Grade II listed buildings and 31 Locally Listed buildings within 500m of the sub-scheme corridor. The location of these assets is presented on **Figure 6-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0009). There are eight non-designated historic buildings within the study area which have been highlighted by SCC[109] as holding local historical value. These assets are presented in **Table 6-2** above and their locations presented on **Figure 6-2** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0008)**.**

KNOWN BELOW-GROUND/SURFACE ARCHAEOLOGICAL REMAINS

6.4.12 There are five heritage assets extending into the maximum physical extent of the Sub-scheme. These are detailed below in **Table 6-3** and comprise the route of the Roman road between Clausentum and Chichester (MSH550), the site of Northam Marsh (MSH5699), the site of the Netley Branch Railway (MSH5710), the suggested route of Roman Aqueducts (MSH394), and the site of an Anglo-Saxon route-way (MSH2063).

A number of below-ground heritage assets have also been identified in the 200m study area and are largely associated with the settlement of Southampton in the Romano-British and Anglo Saxon periods. There are also a significant number of assets dating to Industrial Period which relate to transport, industry and habitation. These assets are presented in **Appendix B-1** and their locations are presented on **Figure 6-2** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0008)**.**

[108] Local Areas of Archaeological Potential
[109] Southampton City Council

Table 6-3 Known Below-ground/Surface Archaeological Remains within the Footprint of Sub-Scheme 2

HER Number	Name / Description	Historic Period
MSH5699	Site of Northam Marsh	Prehistoric (500,000BC to 43AD0 onwards
MSH5710	Site of Netley Branch Railway	Industrial (1750 to 1901)
MSH394	Bitterne - Suggested Routes of Roman Aqueducts	Romano-British (43AD to 410)
MSH2063	Derby Road - site of Saxon route and later country lane	Early Medieval (410 to 1066)
MSH550	Route of the Roman Road between Clausentum and Chichester	Romano-British (43AD to 410)

Figure 6-2 Non Designated Asset Location Plan (Sub-Scheme 2)

POTENTIAL FOR PREVIOUSLY UNRECORDED ARCHAEOLOGY TO BE PRESENT

6.4.13 The Sub-scheme extends through four LAAP[110] which are listed below. Their extents are shown on **Figure 6-2** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0008):

- Bitterne Manor and Southern St Denys (LAAP 11)
- City Centre and Itchen Ferry (LAAP 8)
- Northam (LAAP 12)
- The Rest of Southampton - Area of Potential Archaeological Importance (LAAP 16)

6.4.14 The areas have been classified by SCC[111] as likely to require archaeological evaluation and possible mitigation work in advance of building commencing.

SUB SCHEME 3 – NORTHAM RAIL BRIDGE REPLACEMENT

RECEPTORS

6.4.15 Through evaluation of the baseline information, the following key receptors have been identified:

Table 6-4 Key Heritage Asset Receptors for Sub-Scheme 3

Heritage Asset Type	Asset Name	Value
Grade II Listed Buildings and their settings	Church of St Augustine (1339987), St Mary's Hall 76 St Mary's Street (1393939), Lamp standard in centre of paved area at western end of Bevois Street (1178432), No 33 Palmerston Road (1179004), No 32 Palmerston Road (1339991), Nos 30 and 31 Palmerston Road (1092031) and No 2 New Road (1092025), Bitterne Manor (117845) and 1 Vespasian Road (1091984),	High
Locally Listed Buildings and their settings	92 Northam Road (DSH436),90 Northam Road (DSH435),88 Northam Road (DSH434),Gasholder Station (DSH408), 86 Northam Road (DSH526), 51 and 53 Northam Road (DSH427), 84 Northam Road (DSH433), 82 Northam Road DSH432),80 Northam Road (DSH431),78 Northam Road (DSH430),74 to 76 Northam Road (DSH429),72 Northam Road (DSH428),2 Northam Road (DSH426) Northam Primary School Community Centre and "House by the School", Peel Street (DSH416),St Matthews Church, St Marys Road (DSH449), St Mary's School, Ascupart Street (DSH370), 120 St Mary Street (DSH455), Argyle Centre (DSH369),Britannia Court (DSH407), 128 St Mary's Road (DSH450), James Street Evangelical Church (DSH494), Plumes of Feathers Public House, 73 St Mary Street (DSH453),135 St Mary Street (DSH456),141 St Mary Street (DSH457), Eve of "Adam and Eve" sculptures, Kingsland Estate, Cossack Green (DSH485) and 216 to 238 and 238A (evens) Northam Road (DSH437)	High
Non-designated historical	Southampton Gas Holder Station in Britannia Road - Gas Holder No.9 (MSH459) and Gas Holder No.1 (MSH244), St Matthew's Church	Low

[110] Local Areas of Archaeological Potential
[111] Southampton City Council

Heritage Asset Type	Asset Name	Value
buildings	(MSH3513), and 129 and 131 Northam Road (MSH3924).	
Known and potential buried/surface archaeological remains	Particularly from the Prehistoric (500,000 – AD 43), Romano-British (AD 43 – AD 410), Early Medieval (AD 410 – AD 1066) and (*C*.1750 – 1901) Periods. LAAP 8[112]	Low-Medium

6.4.16 Designated Assets are shown in **Figure 6-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0009) above. Non Designated Assets are shown in **Figure 6-3** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 1008) below.

SCHEDULED MONUMENTS

6.4.17 There are no Scheduled Monuments within the maximum extent of the Sub-scheme or the 500m study area.

HISTORIC BUILDINGS

6.4.18 There are no listed or locally listed buildings within the maximum extent of the Sub-scheme. **Table 6-4** above summarises the nine Grade II listed buildings and 26 Locally Listed buildings within the 500m study area.

6.4.19 There are four non-designated historic buildings within the study area which have been highlighted by SCC[113] as holding local historical value. These assets are presented in **Table 6-4** above and their locations shown on **Figure 6-3** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 1008).

KNOWN BELOW-GROUND/SURFACE ARCHAEOLOGICAL REMAINS

6.4.20 There are three heritage assets which extend into the Sub-scheme boundary. These are detailed below in **Table 6-5** and comprise the site of Former Northam Marsh (MSH5699), the Netley Branch Railway (MSH5710) and the site of a Saxon route and later country lane (MSH2063).

A number of below-ground heritage assets present in the 200m study area and are largely associated with the settlement of Southampton in the Anglo Saxon period. There are also a significant number of assets dating to Industrial period which relate to transport, industry and habitation. These assets are presented in **Appendix B-1** and their locations are shown on **Figure 6-3** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 1008).

[112] Local Areas of Archaeological Potential
[113] Southampton City Council

Table 6-5 Known Below-ground/Surface Archaeological Remains within the Footprint of Sub-Scheme 3

HER Number	Name / Description	Historic Period
MSH5699	Site of Northam Marsh	Industrial (1750 to 1901)
MSH2063	Derby Road - site of Saxon route and later country lane	Early Medieval (410 to 1066)
MSH5710	Site of Netley Branch Railway	Industrial (1750 to 1901)

Figure 6-3 Non Designated Asset Location Plan (Sub-Scheme 3)

POTENTIAL FOR PREVIOUSLY UNRECORDED BURIED ARCHAEOLOGY TO BE PRESENT

6.4.21 The Sub-scheme is located within the City Centre and Itchen Ferry (LAAP8[114]).

SUB SCHEME 5 – BITTERNE RAIL BRIDGE WIDENING

RECEPTORS

6.4.22 Through evaluation of the baseline information, key receptors have been identified as shown in **Table 6-5**.

Table 6-5 Key Heritage Asset Receptors for Sub-Scheme 5

Heritage Asset Type	Asset name	Value
Scheduled Monuments and their settings	Bitterne (Clausentum) Roman station (SM1005538) and Roman piers and revetment in the River Itchen (SM1425731)	High
Grade II Listed Buildings and their settings	Bitterne Manor (117845) and 1 Vespasian Road (1091984),	High
Locally Listed Buildings and their settings	Cobbett Road Library (DSH483)	Medium
Known and potential buried/surface archaeological remains	Particularly from the Roman, Medieval and Industrial Periods LAAP 11 and LAAP 12	Low-Medium

6.4.23 Designated Assets are shown in **Figure 6-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0009) above. Non Designated Assets are shown in **Figure 6-4** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 2008) below.

SCHEDULED MONUMENTS

6.4.24 There are no Scheduled Monuments within the maximum extent of the Sub-scheme. There are two Scheduled Monuments within the 500m study area. The locations of these assets are presented on **Figure 6-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0009).

HISTORIC BUILDINGS

6.4.25 There are no listed or locally listed buildings within the maximum extent of the Sub-scheme. There are two Grade II listed buildings and one Locally Listed building within the 500m study area which are presented above in **Table 6-6**.

[114] Local Areas of Archaeological Potential

KNOWN BELOW-GROUND/SURFACE ARCHAEOLOGICAL REMAINS

6.4.26 There are two heritage assets within the maximum extent of the Sub-scheme which are presented below in Table 6.7 and comprise the route of the Roman road between Clausentum and Chichester (MSH550); and the suggested routes of Roman Aqueducts (MSH394).

A number of below-ground heritage assets have also been identified in the 200m study area and are largely associated with the settlement of Southampton in the Romano-British and Industrial Periods and in particular transport, industry and habitation related. These assets are presented in **Appendix B-1** and their locations are shown on **Figure 6-4** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 2008)**.**

Table 6-6 Known Below-ground/Surface Archaeological Remains within the Footprint of Sub-Scheme 5

HER Number	Name / Description	Historic Period
MSH550	Roman road between Clausentum and Chichester	Romano-British (43AD to 410)
MSH394	Bitterne - Suggested Routes of Roman Aqueducts	Romano-British (43AD to 410)

Figure 6-4 Non Designated Asset Location Plan (Sub-Scheme 5)

POTENTIAL FOR PREVIOUSLY UNRECORDED BURIED ARCHAEOLOGY TO BE PRESENT

6.4.27 The Sub-scheme boundary extends through (Bitterne Manor and southern St Denys (LAAP 11[115]) and The Rest of Southampton (LAAP 16).

6.5 REGULATORY AND POLICY FRAMEWORK

NATIONAL NETWORKS NATIONAL POLICY STATEMENT

6.5.1 The NN NPS[116]) advises that the Secretary of State should also take into account the desirability of new development making a positive contribution to the character and local distinctiveness of the historic environment. The consideration of design should include scale, height, massing, alignment, materials, use and landscaping (for example, screen planting) (ibid).

6.5.2 When considering the impact of a proposed development on the significance of a designated heritage asset, the Secretary of State should give great weight to the asset's conservation. The more important the asset, the greater the weight should be.

6.5.3 The scheme will seek to minimise the loss of historic assets, through consideration of alignments and mitigation, where required. It will also seek to minimise adverse effects on the setting of historic assets and where feasible, obtain improvement through high quality design, materials and landscaping NPPF[117].

6.5.4 Section 12 of the NPPF states that development should "conserve heritage assets in a manner appropriate to their significance, so that they may be enjoyed for their contribution to the quality of life for this and future generations".

6.5.5 It also states that the "significance of any heritage assets affected including any contribution made by their setting... should be understood in order to assess the potential impact. In addition to standing remains, heritage assets of archaeological interest can comprise sub-surface remains and, therefore, assessments should be undertaken for a site with potential below-ground archaeological deposits. This assessment considers standing remains and sub-surface heritage assets. A setting assessment will be undertaken at PCF[118] Stage 2.

6.5.6 The Sub-schemes which require land take, have the potential to affect buried and surface archaeological remains (earthworks) along the route of the Sub-scheme. These locations will need to be investigated further to determine the significance of any heritage assets that may be present, in accordance with NPPF. It is unlikely that there will be archaeological remains buried beneath the existing carriageway as the construction of the road is likely to have removed any archaeology, but this will be considered in future assessment stages.

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[115] Local Areas of Archaeological Potential
[116] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[117] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2
[118] Project Control Framework

6.5.7 There is also a risk that development of the Sub-scheme will impact on the setting of designated and non-designated heritage assets, contrary to NPPF[119] and the SCC Local Plan[120]. The assessment will consider the location of the Sub-scheme in relation to the heritage assets, and mitigation options to reduce this risk. Additional measures will be identified as the scheme design is developed at PCF Stage2.

LEGISLATION

6.5.8 The following legislation is relevant to this section:

- Ancient Monuments and Archaeological Areas Act (AMAAA) which defines sites that warrant protection due to their being of national importance as 'ancient monuments' and ‘monuments’;
- Planning (Listed Buildings and Conservation Areas) (P(LBCA)) Act 1990 which requires schemes that affect a listed building or its setting to have special regard to the desirability of preserving the building or its setting, and Section 72 which requires schemes within conservation areas to preserve or enhancing the character or appearance of that area;
- Treasure Act 1996 states that any finds of treasure and objects found in association with treasure must be reported to the local coroner; and
- Burial Act 1857 requires an appropriate license to be issued by the Ministry of Justice prior to removing human remains from any place of burial.

LOCAL POLICY

SOUTHAMPTON CITY COUNCIL LOCAL PLAN

POLICY CS14 HISTORIC ENVIRONMENT

- The Council will safeguard important historical assets and their settings alongside the character of areas of acknowledge importance including listed buildings, conservation areas, sites of archaeological importance and their setting and parks and gardens of special historic interest. The Council will promote the retention of buildings and structures of local architectural or historical importance identified on the Local List;
- Any proposed developments within the city centre need to pay particular attention to the medieval walled town and the Saxon town (Hamwic) remains, these are nationally important. If necessary proposals should reinstate the historic street pattern: and
- Any new development should reflect and respect the underlying archaeology of the area. Damage of archaeological deposits should be avoided, if feasible, and where damage is unavoidable appropriate mitigation measures should be in place. Historic assets (such as buildings) should be re-used if feasible

[119] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

[120] Southampton City Council; Local Plan: [online] available at: http://www.southampton.gov.uk/planning/planning-policy/default.aspx

6.6 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

6.6.1 As Sub-schemes cross LAAPs[121], an archaeological assessment in the form of a detailed archaeological desk-based assessment with an accompanying scheme of investigative fieldwork will be required in line with NN NPS[122]) and the NPPF. This will determine the significance of any archaeological remains present.

6.6.2 SCC[123] planning policy also requires that adequate provision is made for the identification and investigation of the archaeological resource. Due to the proven presence of the archaeological resources and the high potential for unknown archaeological remains across all of the Sub-schemes, the assessment should be applied to all locations that will cause ground disturbance in areas of land take outside of the Highways boundary. Current legislation draws a distinction between archaeological remains of national importance and other remains considered to be of lesser significance. Those perceived to be of international and national importance may require preservation in situ, whilst those of lesser significance may undergo preservation by record, where they are of Regional/County or Local/Borough.

6.6.3 It is proposed that, where viable and in support of the desk-based assessment, preliminary archaeological investigations are undertaken within land take areas of the preferred scheme option to establish the nature, extent and survival of hitherto unknown below-ground archaeological remains and to determine the significance of known remains. This is likely to comprise a geophysical survey, on areas of green space, followed by an appropriate form of intrusive investigation. Additionally, an archaeological watching brief should be maintained during any pre-construction geotechnical ground investigations.

6.6.4 Sub-scheme 5 lies in close proximity to Bitterne (Clausentum) Roman station (Scheduled Monument 1005538) and the anticipated construction activities within areas of land take have the potential to physically harm this nationally importance asset. The AMAAA[124] advises that Scheduled Monuments must be avoided. Any impact on this asset, either physical or upon its setting must be discussed with Historic England.

6.6.5 None of the listed buildings will be subject to a direct impact. However, SCC[125] HER[126] have recommended that the Bitterne Rail Bridge and Northam Rail Bridge are subject to a Historic England standard building investigation prior to demolition or structural alterations.

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[121] Local Areas of Archaeological Potential
[122] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[123] Southampton City Council
[124] Ancient Monuments and Archaeological Areas Act
[125] Southampton City Council
[126] Historic Environment Record

6.6.6 Historic England (2015) guidelines for mitigation of the impact of a development on the setting of a heritage asset suggest that in the first instance impacts are best mitigated for either by relocation of the development or changes to its design. Where relocation of the development is not feasible, good design alone may be capable of reducing the harm. High quality design will be particularly important for the junction options that may have an adverse effect on the setting of heritage assets. A setting assessment to assess the potential impacts of the Scheme on the setting of designated heritage assets, Local LBCAs[127] need to be reviewed as part of the Desk-Based Assessment process before an appropriate scheme of mitigation can be devised, where applicable.

6.6.7 Monitoring of any archaeological investigations should be undertaken by the SCC Archaeologist, and Historic England will monitor all works associated with statutory designated heritage assets.

6.7 OVERALL ASSESSMENT

CONSTRUCTION PHASE

SUB-SCHEME 1 - M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

Option 1 – Localised Junction Widening and Option 3 - Free-flow left-turn slip lanes at M27 Junction 8

6.7.1 All construction works will take place within the highways boundary, and within which the potential for undisturbed below-ground archaeological remains to be present is considered to be low. During this phase there is likely to be an increase in visual, lighting and acoustic intrusion due to the activities and plant. As all activities will be confined to the highway boundary, the impacts on the settings of the listed buildings in the study area surrounding the Sub-scheme is likely to be negligible.

6.7.2 Option 3 is expected to have the same impact as Option 1 on below-ground archaeological remains and on the setting of listed buildings.

Option 2 – Through-about to A3024 Bursledon and Option 4 - Through-about to A3025 Hamble Lane

6.7.3 This option is similar to Option 1, with a variation to the improvement works around the Windhover Roundabout. Carriageway widening would result in the excavation of areas within the existing highway boundary and also the excavation of ground in the centre of the Windhover roundabout.

6.7.4 It is unlikely that earthmoving activities within the existing highway boundaries will cause harm to below-ground remains, as the likelihood of preservation within these previously disturbed areas is considered to be low. There is, however, potential for unknown archaeological remains to survive within the centre of Windhover roundabout and groundworks including topsoil stripping, excavations, drainage etc. have the potential to disturb or cause the loss of these potential remains.

[127] Listed Buildings and Conservation Areas

6.7.5 During this phase there is likely to be an increase in visual, lighting and acoustic intrusion due to the activities and plant. As all activities will be confined to the highway boundary, the impacts upon the settings of the listed buildings in the vicinity of the Sub-scheme are likely to be negligible. This option has the potential to cause moderate/large adverse construction effects on archaeological remains, which would remain once the scheme is operational.

6.7.6 Option 4 is expected to have the same impact as Option 2 on below-ground archaeological remains and on the setting of listed buildings.

Option 5 – Tunnel under Windhover Roundabout

6.7.7 This option proposes the same improvements to M27 Junction 8 as Options 1, 2 and 4. The variation to this option is the construction of a tunnel under the Windhover Roundabout to link the A3024 to A3024 Bursledon Road. The tunnelling would result in extensive site clearance for both widening and improvement works to existing carriageway and for site preparation.

6.7.8 The excavation of a tunnel and any site clearance activities have the potential to disturb below-ground remains which survive within this area of previously undisturbed ground. The impact upon below-ground archaeological remains and upon the setting of listed buildings is considered to be the same as Option 2 and 4.

SUB-SCHEME 2 – A3024 EASTERN ACCESS CORRIDOR

Level 1 - Signal control improvements

6.7.9 No impacts upon cultural heritage are envisaged for this option as no constructions works are proposed.

Level 2 - Junction and signal improvements

6.7.10 No impacts upon cultural heritage are envisaged for this option as limited constructions works are proposed.

Level 3 - Dualling full A3024 corridor

6.7.11 Level 3 improvements include carriageway widening to provide two lanes in both directions along the entire A3024 corridor. The carriageway widening, particularly east and west of Northam Rail Bridge, Bath Road junction along A3024 Bursledon Road and at Botley Road, would result in substantial amounts of land take. In order for construction to take place, it would be necessary to remove areas of vegetation which comprise grass, shrubs and woodland, and developed land including housing and hard-standing.

6.7.12 Any earthmoving activities within areas of land take that has not been subject to previous disturbance has the potential to cause the loss and disturbance of known and potential buried/surface archaeological remains.

6.7.13 As the majority of construction will be undertaken within or close to the existing highway boundary, the impact of the Sub-scheme option upon the setting of Bitterne (Clausentum) Roman station (SM1005538) and Roman piers and revetment (SM1425731), listed and locally listed buildings is considered to be negligible.

6.7.14 This option has the potential to cause moderate/large adverse construction effects on archaeological remains.

SUB-SCHEME 3 – NORTHAM RAIL BRIDGE REPLACEMENT

6.7.15 The four options for Sub-scheme 3 are expected to have the same cultural heritage impact, and the findings have therefore been presented together.

Option 1 – All Options

6.7.16 There are no scheduled monuments, listed or locally listed buildings in the immediate vicinity of Northam Rail Bridge. Therefore, the options are unlikely to have a significant impact upon setting of these assets.

6.7.17 These options all require some additional land take of mainly vegetated areas. .Any earthmoving activity within areas of land take that has not been subject to any previous disturbance has the potential to cause the loss and disturbance of known and potential buried/surface archaeological remains.

6.7.18 Option 1, 2 3A and 3B all have the potential to cause moderate/large adverse construction effects on archaeological remains.

SUB-SCHEME 5 – BITTERNE RAIL BRIDGE WIDENING

Option 1 - Tidal Flow Gantry System

6.7.19 No impacts upon cultural heritage are envisaged for this option as no or limited external constructions works are proposed.

Option 2 - Widening of Existing Bridge and Option 3 - Replacement (Widening) of Existing Deck

6.7.20 Option 2 and 3 are expected to have the same cultural heritage impact, and the findings have therefore been presented together.

6.7.21 These options involve localised widening to the north of Bitterne Rail Bridge, resulting in land take. Amendments or realignments to the existing road network would be required. This would involve demolition of the existing carriageway for the new alignment and some additional land take of mainly areas of vegetation.

6.7.22 Part of the scheduled monument of Bitterne (Clausentum) Roman station (SM1005538) borders the southern edge of the Sub-scheme's maximum extent. Therefore there is potential for this site to be physically harmed during earthmoving activity within areas of land take. The loss and disturbance of known and potential non-designated buried/surface archaeological remains is also likely.

6.7.23 It is likely that there will be an increase in visual, lighting and acoustic intrusion due to the activities and plant during construction which could have a detrimental effect upon the setting of SM1005538. The experience and appreciation of the asset may be compromised as a result of these activities.

6.7.24 These options have the potential to cause large/very large adverse construction effects on archaeological remains and a moderate/large adverse effect upon the setting of Bitterne (Clausentum) Roman station (SM1005538).

OPERATIONAL EFFECTS

6.7.25 Due to the proposed scale of the Scheme, its proximity to the existing highways boundary and the location of designated heritage assets in relation to it, it is considered there will no significant effects upon the setting of designed assets during the operational phase with the exception of Bitterne (Clausentum) Roman station (SM1005538) which lies on the southern border of Sub-scheme 5.

6.7.26 This option has the potential to cause large/very large adverse operational effects on archaeological remains and a moderate/large adverse effect upon the setting of Bitterne (Clausentum) Roman station (SM1005538).

SUMMARY OF SUB-SCHEME IMPACTS

6.7.27 **Table 6-7** summarises the construction and operational effects of the sub-schemes described above.

Table 6-7 Summary of Effects

Sub-scheme	Option	Significance of Effect	
		Construction	Operation
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades	Option 1 : Localised Junction Widening	Archaeology – negligible Setting of Build Heritage - negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Option 2 : Through-about to A3024 Bursledon	Archaeology - moderate/large adverse Setting of Build Heritage - negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Option 3 : Free-flow left-turn slip lanes at M27 Junction 8	Archaeology – negligible Setting of Build Heritage - negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Option 4 : Through-about to A3025 Hamble Lane	Archaeology – moderate/large adverse Setting of Build Heritage - negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Option 5 : Tunnel under Windhover Roundabout	Archaeology – moderate/large adverse Setting of Build Heritage - negligible	Archaeology – negligible Setting of Build Heritage - negligible
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1: Signal control improvements	Negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Level 2: Junction and signal improvements	Negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Level 3: Dualling full A3024 corridor	Archaeology – moderate/large adverse Setting of Build Heritage - negligible	Archaeology – negligible Setting of Build Heritage - negligible

Sub-scheme	Option	Significance of Effect	
		Construction	Operation
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1: New bridge / Refurbish existing bridge	Archaeology - moderate/large adverse Setting of Build Heritage – negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Option 2: New bridge / Raise and refurbish existing bridge	Archaeology - moderate/large adverse Setting of Build Heritage – negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Option 3A: New bridge / Demolish and replace existing - close subway	Archaeology - moderate/large adverse Setting – negligible	Archaeology – negligible Setting of Build Heritage - negligible
	Option 3B: New bridge / Demolish and replace existing - retain subway	Archaeology - moderate/large adverse Setting – negligible	Archaeology – negligible Setting of Build Heritage - negligible
Sub-scheme 5: Bittern Bridge Widening	Option 1: Tidal flow gantry system	Archaeology – negligible Setting of Build Heritage - negligible	Archaeology - negligible Setting of Build Heritage - negligible
	Option 2: Widening of existing bridge	Archaeology - large/very large adverse Setting of Build Heritage – moderate/large adverse	Archaeology - large/very large adverse Setting of Build Heritage - moderate/large adverse
	Option 3: Replacement (widening) of existing deck	Archaeology - large/very large adverse Setting of Build Heritage - moderate/large adverse	Archaeology - large/very large adverse Setting of Build Heritage - moderate/large adverse

ASSESSMENT OF DO MINIMUM/DO SOMETHING SCENARIOS

6.7.28 This section characterises the potential ecological impacts that are likely to arise during construction and operation of four scenarios:

6.7.29 The overall impacts for each of the four development option scenarios for consideration, as described in **Section 3**, are discussed below.

Do Minimum – Smart Motorways without Scheme

6.7.30 This development option encompasses no Sub-Scheme options. At this high level assessment, this option is considered to have a Neutral impact.

Do Something 1 - Dualling of A3024 Corridor

6.7.31 This scenario will result in significant amounts of land take, which will include areas of vegetation, comprising mainly of grass, shrubs and woodland and developed land, including housing and hard standing. Further works would be required to widen the existing bridge over the Bitterne railway and the joining carriageway to implement a new alignment.

6.7.32 At this high level assessment it is considered that this option would have a large/very large adverse impact upon hitherto unknown archaeological remains and the non-designated Bitterne Rail Bridge.

6.7.33 Part of the scheduled monument of Bitterne (Clausentum) Roman station (SM1005538) is located very close to the proposed works, therefore there is potential for this site to be physically harmed during earthmoving activity within areas of land take.

Do Something 2 Option

6.7.34 This scenario will result in significant amounts of land take, which will include areas of vegetation, comprising mainly of grass, shrubs and woodland and developed land, including housing and hard standing. Further works would be required to widen the existing bridge over the Bitterne railway and the joining carriageway to implement a new alignment.

6.7.35 At this high level assessment it is considered that this option would have a large/very large adverse impact upon hitherto unknown archaeological remains and the non-designated Bitterne Road Rail Bridge.

6.7.36 Part of the scheduled monument of Bitterne (Clausentum) Roman station (SM1005538) is located very close to the proposed works. Therefore there is potential for this site to be physically harmed during earthmoving activity within areas of land take.

Do Something 3 – Sub-Scheme 1 Only

6.7.37 At this high level assessment it is considered that this option would have a negligible impact upon hitherto unknown archaeological remains and the setting of designated assets

SUMMARY OF DO MINIMUM/DO SOMETHING SCENARIOS

6.7.38 Overall it is considered that the scenario with the most impact upon cultural heritage would be Do Something 1 and Do Something 2. Both these options have the potential to have a large/very large adverse effect on below-ground archaeological remains and are at risk of physically harming the scheduled site of Bitterne (Clausentum) Roman station (SM1005538). The scenarios with the least impact are the Do Minimum and Do Something 3 as all the proposed works would be confined to the highways boundary, and will therefore have a minimal impact on below-ground archaeological remains.

6.8 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

6.8.1 No site visit was undertaken in compiling the ESR[128] and therefore comments relating to the impact of the Sub-schemes on the setting of the assets must be seen as provisional.

[128] Environmental Study Report

7 LANDSCAPE, TOWNSCAPE AND VISUAL ASSESSMENT

7.1 INTRODUCTION

7.1.1 This section provides a high-level evaluation of the existing landscape/townscape resource and visual receptors near to the proposed M27 Southampton Junctions scheme. It identifies potential landscape and visual constraints and makes a preliminary assessment of the significance of effects associated with each of the four sub-schemes described in **Section 3**.

7.1.2 The character of the landscape relates to the natural processes and human activities that have been at work over a long time to shape the land to its present form. Factors contributing to landscape character include topography, vegetation cover, sense of space and enclosure and past and present land use. Townscape refers to areas where the built environment is dominant. Visual amenity is defined as the appreciation of the views people enjoy of their surroundings.

7.2 ASSESSMENT METHODOLOGY

LANDSCAPE

7.2.1 Landscape and visual assessments are separate, although linked, procedures. The assessment of landscape is concerned with effects on the landscape resource (i.e. landscape elements and character). Effects on the landscape from a scheme can cause direct changes to the physical elements of the receiving landscape including its features, character and quality and, more widely, indirect effects on the character and quality of the surrounding landscape.

7.2.2 A simple landscape assessment has been undertaken in accordance with Highways England guidance in IAN135/10[129] Landscape and Visual effects Assessment, (2010) and DMRB[130] Volume 11 Section 3 Part 5 Landscape Effects (1993). It has also drawn on guidance from the GLVIA [131] (3rd Edition) published jointly by The Landscape Institute and Institute of Environmental Management and Assessment, 2013. The terminology used for the assessment of landscape and visual effects is based on IAN 135/10.

7.2.3 Published landscape and townscape character assessments, descriptions of landscape designations and site survey have been used to describe and evaluate the quality and sensitivity of the landscape within the study area. Landscape character has been assessed for its sensitivity to change, and its capacity to accommodate change of the nature proposed. These descriptions have formed the basis upon which the magnitude of impacts and significance of effects have been judged.

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[129] Interim Advice Note (IAN)135/10; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

[130] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

[131] Guidelines for Landscape and Visual Impact Assessment (3rd Edition); (Guidelines for Landscape and Visual Impact Assessment (GLVIA); (2013).

VISUAL

7.2.4 Visual effects are assessed as one of the interrelated impacts on people. Visual amenity is defined as the appreciation of the views people enjoy of their surroundings. The visual assessment has followed the same guidance as the landscape assessment.

7.2.5 Groups of similar visual amenity receptors were identified, and their sensitivity ascertained. Sensitivity is dependent on the location and context of the view; the expectation, occupation or activity of the visual receptor; and the importance of the view, which may be determined by its popularity, number of people affected, and whether it is a tourist attraction or has literary or artistic references.

BASELINE STUDIES

7.2.6 A high level desk study and site analysis of the physical landscape / townscape and its spatial components (e.g. scale, key views) was undertaken to identify key landscape/townscape characteristics and features, key visual receptors, as well as broad site constraints and opportunities to be considered in the selection of options.

7.2.7 Preliminary baseline information was based on a combination of field survey and desk study, which was obtained from:

- The following published landscape character assessments at regional and local scale:
  - National Character Area profile NCA 128[132].
  - Hampshire County Integrated Character Assessment[133]
  - SCC City Characterisation Project 2009[134].
- Ordnance Survey Explorer Map OL22 New Forest.
- Google Earth Pro.
- Government and local authority current landscape planning policies.
- National, County and District council landscape designations.
- Site survey (undertaken in July 2016).

[132] National Character Area profile NCA 128. South Hampshire Lowlands, Natural England: [online] available at: http://publications.naturalengland.org.uk

[133] Hampshire County Integrated Character Assessment: [online] available at: http://www3.hants.gov.uk/landscape-and-heritage/hampshire-integrated-character-assessment.htm

[134] Southampton City Council City Characterisation Project 2009 http://www.southampton.gov.uk/planning/planning-policy/supplementary-planning/characterisation-appraisal.aspx

7.2.8 The quality and sensitivity of the landscape and its capacity to accommodate change of the nature proposed was evaluated from this information, and has formed the basis upon which the magnitude of impacts and significance of effects have been judged.

7.2.9 The levels of sensitivity assigned to the landscapes (high, moderate or low) are based on criteria in Table 2 of Annex 1 of IAN 135/10[135]. Similarly, the determination of the levels of sensitivity of the visual receptors is based on Table 1 of Annex 2 of IAN135/10.

MAGNITUDE OF IMPACT

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

SIGNIFICANCE OF EFFECT

7.2.11 The evaluation and significance of the landscape and visual effects of the scheme is derived by assessing the sensitivity of the landscape and visual receptors against the magnitude of impact [allowing for mitigation]. Typical descriptors for the significance of effect are described in IAN 135/10 Annex 1 Table 4 (Landscape) and Annex 2 Table 4 (Visual Effects).

7.3 STUDY AREA

7.3.1 In accordance with IAN135/10 guidance, the spatial scope of the study area for landscape/townscape effects covers the scheme site and the wider area within which the scheme may influence character and neighbouring features of special value. The study area for visual effects includes the zone of visual influence (ZVI) of the existing junctions and the whole of the area from which the scheme could be visible. In this context, the ZVI is limited by nearby buildings and mature vegetation which surround and screen views at each junction.

7.3.2 The spatial scope of the study area for this assessment comprising an area offset approximately 1km from Sub-schemes 1, 3 and 4 and 0.5km from Sub-scheme 2.

7.4 BASELINE CONDITIONS

LANDSCAPE CONTEXT

7.4.1 There are no national or local landscape-related designations within the study area.

7.4.2 **Section 8** Nature Conservation describes and assesses potential effects on areas designated as protected habitats. Sites of Nature Conservation Importance that could influence landscape mitigation proposals lie in close proximity to the Windhover Roundabout.

7.4.3 **Section 6** Cultural Heritage describes and assesses potential effects on archaeology and heritage assets.

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[135] Interim Advice Note (IAN) 135/10; Highways England; [online] available at: http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

LANDSCAPE CHARACTER

NATIONAL CHARACTER AREA 128 - SOUTH HAMPSHIRE LOWLANDS

7.4.4 The study area lies within Natural England's National Character Area 128 South Hampshire Lowlands. It notes, "*The South Hampshire Lowlands is a low-lying plain between the chalk hills of the Hampshire and South Downs and Southampton water. The NCA is dominated by the city and port of Southampton and its adjoining towns and suburbs – 29 percent of the area is urban. In the more rural areas, it is a mixture of farmland, particularly pasture, and woodland."* There is little intervisibility between the scheme and the surrounding rural landscape.

HAMPSHIRE COUNTY INTEGRATED CHARACTER ASSESSMENT (HCICA)

7.4.5 The study area for Sub-scheme 1 and a small section of Sub-scheme 2 include rural and urban landscape and are described with reference to the HCICA Netley, Bursledon and Hamble Coastal Plain landscape character area. Townscape aspects of these sub-schemes, as well as Sub-schemes 3 and 5, which are located in urban areas, are described from **Section 7.4.8** to **Section 7.4.17**.

7.4.6 All of Sub-scheme 1 and the southeastern end of Sub-scheme 2 lie within this Landscape Character Area (LCA) which lies between the River Hamble to the east and Southampton Water to the south. The key characteristics within the study area are:

- A wooded coastal margin, small wooded stream valleys, a central area of farmland with open character and a suburban feel to much of the area.
- Busy road and minor lane network of slow moving traffic.
- Market gardening, nurseries and horsiculture are frequent land uses.
- A landscape which had a well-developed medieval field pattern around small hamlets and a large area of common land at the 19th century – now largely overwritten by modern fields and development.
- Overt human influence of traffic and modern development over much of the area engenders a sense of low tranquillity.

7.4.7 The landscape in the study area has low sensitivity; it would be able to accommodate change of the type proposed and contains landscape features and elements that could be replaced.

TOWNSCAPE

7.4.8 Townscape character is described below in relation to Sub-schemes 1, 2 and 4 with reference to the HCICA. All of the sub-schemes lie outside the City Centre Action Plan boundary except Sub-scheme 3 (Northam Rail Bridge replacement) which is described with reference to the SCC City Characterisation Project (SCCCP) (2009).

Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades

7.4.9 Townscape in the immediate vicinity of Sub-scheme 1 at Bursledon is characterised by large scale commercial development, which includes a superstore, public house/restaurant and garden centre with access near Windhover Roundabout. Although these developments are ordinary in appearance, they are located within an attractive verdant setting comprising mature trees and shrubs (predominantly native species) similar to the planting at M27 Junction 8 and Windhover roundabout. Further south the townscape is characterised by mid to late 20th century detached residential development with abundant tree planting between the A27 and A3025.

7.4.10 Elsewhere within the rural area adjacent to this sub-scheme the road network has straight alignment characteristics typical of an area associated with areas of common land, e.g. the B3033, with small linear settlements. Further north at Thornhill the townscape comprises large areas of mid-20th century housing mostly built by SCC[136].

7.4.11 Hedge End, which lies on the eastern side of the M27, comprises a small village dating back to the 18th century and large residential areas that were developed since the 1980's following the construction of the M27 motorway.

Sub-scheme 2: A3024 Eastern Access Corridor

7.4.12 The townscape character at the eastern end of the route at Thornhill comprises large areas of mid-20th century housing. Further west at Bitterne it comprises a pedestrianised retail centre which was developed in the 1960s / 70s and includes supermarkets, other shops, offices services and a weekly market. The main part of the centre is separated from the leisure centre, library and health clinic by the A3024.

7.4.13 Extensive areas of residential development lie within the study area and include predominantly terraced and semi-detached housing dating from the mid-20th century.

Sub-scheme 3: Northam Rail Bridge Replacement

7.4.14 Sub-scheme 3 lies within SCCCP[137] character areas 28. Golden Grove Estate, 30. Old Northam Road and 43 St Mary's Stadium. This townscape is characterised by large scale transport routes, the A3024 (Northam Road) and railway, gas holders and St Mary's Stadium, which are old and new landmarks respectively. The A3024 reduces from a two lane dual carriageway to single lanes at Northam Rail Bridge where it rises to cross over the railway line. Land uses adjacent to Northam Road to the east of the railway line include widely-spaced low rise commercial/industrial units. To the west the townscape comprises terraced housing with local shops interspersed with open spaces and mature trees.

7.4.15 The gas holders, which can be up to 25m high, are locally listed because they are distinctive city landmarks and relate to a particularly successful period in Southampton's history. With the exception of these landmark features, the townscape is ordinary and lacks distinctive character next to the A3024. Away from the main road, older residential development and the small shopping area on Old Northam Road is characterised by a mix of ethnic minority shops, restaurants and student enterprises. Overall, the townscape is undergoing major changes which are apparent from widespread areas of urban regeneration with more new development planned in the Core Strategy[138].

Sub-scheme 5: Bitterne Rail Bridge Widening

7.4.16 Sub-scheme 5 lies within Bitterne to the north-east of Southampton which was originally developed as a suburb of the town in the 19th century. It comprises a pedestrianised retail centre which was developed in the 1960s / 70s and includes supermarkets, other shops, offices services and a weekly market. The recently widened A3024 separates the main part of the centre from the leisure centre, library and health clinic.

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[136] Southampton City Council
[137] Southampton City Council City Characterisation Project
[138] Southampton Local Plan: [online] available at: http://www.southampton.gov.uk/planning/planning-policy/adopted-plans/default.aspx

7.4.17 Extensive areas of residential development lie within the study area and include predominantly terraced and semi-detached housing dating from the mid-20th century.

VISUAL BASELINE

Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades

7.4.18 Filtered views of M27 Junction 8 and Windhover roundabout are available to people using nearby commercial facilities and restaurant/hotel. Generally, views are screened by mature woodland planting that surrounds the junctions except where views of Windhover roundabout are available from a small number of residential properties to the east of the roundabout.

Sub-scheme 2: A3024 Eastern Access Corridor

7.4.19 Close views of the A3024 are widely available to occupiers of adjacent residential properties, people using local community facilities, shops and services, open space and allotments. Where houses face on to the A3024 they are frequently close to the road and either adjoin the pavement or are separated by a small front garden.

Sub-scheme 3: Northam Rail Bridge Replacement

7.4.20 Views of Northam Rail Bridge are available from nearby commercial/industrial units, residential properties and local shops. Solid parapets screen views from the elevated railway bridge that could overlook nearby residential properties.

Sub-scheme 5: Bitterne Rail Bridge Widening

7.4.21 Views of Bitterne Rail Bridge are available from nearby 2 storey and 3 storey residential properties and local shops.

7.5 REGULATORY AND POLICY FRAMEWORK

EUROPEAN POLICY

7.5.1 The European Landscape Convention (2000)[139] recognises that all landscapes should be considered in any assessment of effects “that the landscape is an important part of the quality of life for people everywhere: in urban areas and in the countryside, in degraded areas as well as areas of high quality, in areas recognised as being of outstanding beauty as well as every day areas.” This importance is recognised in this landscape assessment.

[139] European Landscape Convention (Florence: Council of Europe, 2000, ETS 1X6); [online] available at: http://conventions.coe.int/Treaty/EN/Treaties/Html/176.htm

NATIONAL POLICY

NATIONAL PLANNING POLICY FRAMEWORK 2013

7.5.2 The NPPF[140] paragraph 109 refers to valued landscapes. It recognises Landscape as being an important part of sustainable development and in particular its environmental role as a contributing factor in understanding the natural, built and historic environment. NPPF 56 attaches great importance to the design of the built environment and the need for good design which should contribute positively to making better places for people. The scheme will use good design to reduce landscape effects.

NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS

7.5.3 The NN NPS[141] paragraph 5.160 states "*Adverse landscape and visual effects to be minimised through the appropriate siting of infrastructure, design (including choice of materials) and landscaping schemes, depending on the size and type of proposed project. Materials and designs for infrastructure should always be given careful consideration."* The scheme will give careful consideration to design and use of materials, materials is considered in **Section 10**.

LOCAL POLICY

7.5.4 The scheme lies within the jurisdiction of two local authorities; Sub-schemes 3, 5 and most of Sub-scheme 2 lie within Southampton City, Sub-scheme 1 and the eastern section of Sub-scheme 2 lie within Eastleigh Borough.

SOUTHAMPTON CITY COUNCIL CORE STRATEGY – AMENDED (MARCH 2015)

7.5.5 The SCC Core Strategy[142] has the following policies of relevance:

- → Strategic Objectives S7, S14 and S15 – Strong and Distinctive Neighbourhoods
- → Policy CS13 – Fundamentals of Design
- → Policy CS21 – Protecting and Enhancing Open Space

7.5.6 The scheme will respond to these policies by providing high quality design and landscaping that reflect the distinctive character of the local environment, and seeks opportunities to enhance public open spaces[143].

7.5.7 SCC's[144] Supplementary Planning Documents (SPD) also provide policy context including the following:

- → SPD 6 Urban Design Principles (city centre only)

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[140] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

[141] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks

[142] Southampton Local Plan: Web reference http://www.southampton.gov.uk/planning/planning-policy/adopted-plans/default.aspx

[143] Note: Consultation with the SCC Planning Ecologist (*personal communication* on 28/11/2016) indicated that all of the identified Sites of Importance for Nature Conservation (SINC) in Southampton are also designated public open space (see **Section 8.3.10**).

[144] Southampton City Council

- SPD 7 Context
- SPD 8 Urban Form and Public Space
- SPD 12 Landscape and Biodiversity

7.5.8 The scheme will respond to these policies by considering key design principles, responding to the character of the area, and being integrated into the public realm. A landscape and biodiversity creation and management plan, and tree constraints plan, will be prepared at PCF[145] Stage 3.

EASTLEIGH BOROUGH COUNCIL ADOPTED LOCAL PLAN (2001-2011)

7.5.9 Planning policy is provided within the saved policies of the Eastleigh Borough Council Local Plan[146]. The following policies are relevant:

- 18.CO – requires schemes to respect the intrinsic character of the landscape
- 19.CO – requires schemes to avoid the loss of or damage to locally important features in the landscape
- 20.CO – requires schemes on major transportation corridors to provide landscape improvements.

7.5.10 The scheme will use high quality design, landscaping, planting, materials, and be integrated into the local environment and public realm. Design, mitigation and enhancement measures, including monitoring requirements

7.6 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

DESIGN

7.6.1 **Section 3** provides a detailed description of the sub-schemes and options being considered. The conceptual 2D designs illustrate the broad horizontal alignment for the sub-schemes. Design information for the proposed structures, signage, lighting, earthworks and land take, which could have an impact on views as well as the surrounding landscape, is not available at PCF stage 1. This will be considered in an update to the ESR[147] as the design is progressed at PCF Stage 2.

MITIGATION AND ENHANCEMENT

7.6.2 All of the sub-schemes will include embedded mitigation and, through the aesthetic design of the bridge and associated hard landscaping, each option will enhance the urban setting where possible. Although the options are located in an urban context where opportunities exist for hard landscape mitigation, new planting may not be possible or required. Therefore, landscape mitigation is likely to be limited to Sub-scheme 1: M27 Junction 8 and Windhover Roundabout and the eastern section of Sub-scheme 2: A3024 Eastern Access Corridor.

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[145] Project Control Framework
[146] Eastleigh Borough Council Adopted Local Plan (2001-2011): [online] available at: https://www.eastleigh.gov.uk/planning-building/planning-policy-and-implementation/local-plan/adopted-local-plan.aspx
[147] Environmental Study Report

MITIGATION DURING CONSTRUCTION

7.6.3 Landscape effects at the construction phase include loss of highway planting and grassland (where present) to accommodate the scheme and disturbance from the construction activities (noise, lighting etc.). The area affected will be similar to the operational phase and cannot be fully mitigated. Although views of the construction activities cannot be fully screened and would usually be more adverse than at operation, they would temporary.

7.6.4 During construction all existing tree, shrub and hedgerow planting within the highway boundary would be retained wherever feasible and protected in accordance with BS5837:2012 titled 'Trees in relation to design, demolition and construction. Recommendations.'

7.6.5 The extent of mature trees adjacent to the highway boundary of Sub-schemes 2, 3 and 5 represents a key constraint during construction. Where site clearance and or excavation involves the cutting / loss or damage to roots within the highway boundary but associated with trees outside it, remedial works may be required to ensure the long term health and safety of the affected vegetation, or if necessary, replacement planting. Works affecting offsite vegetation would require the agreement of the landowner.

MITIGATION AT OPERATION

7.6.6 At operation landscape mitigation and enhancement measures would follow guidance in the Highways England DMRB[148], Volume 10: Environmental Design and Management, Section 0: Environmental Objectives. The landscape proposals would be designed to complement the landscape elements and environmental functions of the adjoining soft estate and would comprise similar locally occurring desirable native species of trees, shrubs, wildflowers and grasses. The first principle of the landscape design would be to retain and protect as much of the existing roadside vegetation within the highway estate as is feasible. The second principle would be to carry out new planting for landscape and visual mitigation and to replace any vegetation lost due to construction of the improvements.

7.6.7 Mitigation planting would be monitored annually between the opening year (year 1) and the design year (year 15) to ensure the intended design objectives were achieved, i.e. to reduce adverse landscape and visual impacts and to integrate the scheme into the surrounding landscape.

7.6.8 Alternatives to masonry retaining walls, which would have an urban appearance, could include gabion basket or timber crib gravity retaining walls, preferably incorporating some climbing or trailing plants, which would be more aesthetically attractive and sustainable.

7.7 OVERALL ASSESSMENT

ASSESSMENT OF LANDSCAPE AND TOWNSCAPE EFFECTS

7.7.1 The roads, junctions, bridges and highway planting within the scheme are all established features in the surrounding landscape and townscape. This assessment considers the potential landscape and visual impacts that would arise from the key features of each sub-scheme and how these effects would differ from the existing situation. Refer to **Section 3** for a description of the proposed Sub-schemes.

[148] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

7.7.2 Because landscape mitigation (screen planting) has not been included at this early design stage, potential effects are assessed without mitigation and the possible additional effects of mitigation are noted.

SUB-SCHEME 1: M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

7.7.3 All of the proposed options (Options 1 to 5) for Sub-scheme 1 could be accommodated within the Hampshire CC highway boundary.

Option 1 – Signalisation and Widening at Windhover Roundabout and M27 Junction 8 and Option 3 - Free-flow left-turn slip lanes at M27 Junction 8

7.7.4 There would be a minor increase in the overall scale of the M27 Junction 5 roundabout and Windhover roundabout from Option 1 through the addition of the new built elements. The new roads, signage etc. would be an incremental increase in road infrastructure which would be barely noticeable or indistinguishable from the existing elements.

7.7.5 Option 1 would not affect the mature woodland planting within Windhover roundabout, which is locally important for visual amenity, visual screening and for reducing the overall scale of the junction. However, small areas of planting and grassland would be lost elsewhere from within the footprint of the scheme to accommodate the carriageway widening. It appears likely that most of the mature tree and shrub planting along the adjoining roads - Hamble Lane, Providence Hill and the A3024 - would be retained on the eastern side of the junction. Here the planting is important for visual amenity; it creates attractive tree-lined streets and filters views between the junction and adjacent large-scale commercial premises (superstore, pub/restaurant and garden centre).

7.7.6 Mature scrub, woodland and grassland lost from the footprint of Option 1 within the highway boundary could be replaced over time with new planting and seeding.

7.7.7 The magnitude of landscape impact from Option 1 would be minor adverse; damage to existing landscape character and features would be barely noticeable and the new built elements would be similar to the existing road infrastructure.

7.7.8 There would be no direct or indirect impacts on the townscape adjacent to Option 1 and the effects would be neutral.

7.7.9 Option 1 would cause limited deterioration but would not alter the overall composition of views from the small number of nearby residential properties. Overall, the magnitude of visual impact is likely to be negligible. The visual effect is likely to be slight adverse and not significant.

7.7.10 Option 3 includes the same proposals as Option 1 for new signals, localised widening and new NMU[149] facilities at Windhover Roundabout. New dedicated left turning slip-lanes on all approaches of the M27 Junction 8 would require more significant offline carriageway construction and larger scale junction improvements compared to the other proposed options for the M27 Junction 8. The extent of mature scrub, woodland and grassland lost from the footprint of Option 3 would be similar to Option 1. New planting and grass seeding could be undertaken within the highway boundary which, over time, would ensure no overall net loss of tree and shrub cover or grassland.

7.7.11 Landscape / townscape and visual impacts from Option 3 are considered similar to Option 1.

[149] Non-Motorised User

Option 2 – Signalisation and localised widening at Windhover Roundabout and Through-about across Windhover Roundabout to A3024 Bursledon Road

7.7.12 This option involves new traffic signalisation and localised widening of the M27 Junction 8 and new NMU facilities, as described above, with a variation to the improvement works around the Windhover Roundabout. This option proposes to construct a through-about lane across Windhover Roundabout linking the A3024 to A3024 Bursledon Road. With the exception of the through-about, the associated level of surrounding carriageway widening would be similar to that of Option 1. Although the through-about would cause an extensive area of offline works, all of the proposed improvements would be accommodated within the Hampshire CC highway boundary.

7.7.13 Option 2 would be a noticeable increase in the overall scale of Windhover roundabout through the addition of new built elements. The new two lane dual carriageway in cutting through Windhover roundabout would bisect the area of mature woodland leaving small areas of vegetation to the north and south of the new road. The extent of visual impact would depend on whether sufficient woodland could be retained to reduce or screen views across the roundabout from nearby residential receptors and people at the commercial premises. Option 2 is likely to include extensive earthworks and new retaining walls, and would result in an overall net loss of woodland and scrub vegetation within the highway boundary.

7.7.14 The magnitude of impact from Option 2 would be minor adverse; the proposed two lane dual carriageway, extensive earthworks and loss of vegetation would be noticeable and would damage the existing landscape character. The significance of effect on the Netley, Bursledon and Hamble Coastal Plain LCA[150], which has low sensitivity, would be slight adverse and not significant.

7.7.15 There would be no direct or indirect impacts on the townscape adjacent to Option 2 and the effects would be neutral.

7.7.16 Option 2 would cause limited deterioration but would not alter the overall composition of views of Windhover roundabout from the small number of nearby residential properties. Overall, the magnitude of visual impact is likely to be moderate or minor, depending on the extent of woodland planting removed from within Windhover roundabout and the amount of replacement planting undertaken. Under the worst case scenario the visual effect is likely to be of moderate adverse significance.

7.7.17 Option 2 would have a greater impact on landscape elements due to the overall net loss of woodland and grassland and new built elements which would be similar to the existing road infrastructure. The significance of effect would be Moderate adverse.

[150] Landscape Character Area

Option 4 – M27 Junction 8 signalisation and localised widening at Windhover Roundabout, and full NMU facilities, as well as a Through-about lane across Windhover Roundabout linking to A3025 Hamble Lane

7.7.18 This option is similar to Option 2 within this sub-scheme. It involves signalisation and localised widening of the M27 Junction 8 and new NMU[151] facilities with a variation to the improvement works around the Windhover Roundabout. Carriageway widening would result in the loss of predominantly vegetated areas within the existing highway boundary. This option proposes a through-about across Windhover Roundabout linking the A3025 to Hamble Lane. The associated impacts would be similar to Option 2.

7.7.19 Landscape / townscape and visual impacts from Option 4 are considered similar to Option 2. Option 4 would have a greater impact on landscape elements due to the overall net loss of woodland and grassland, and deterioration of views from residential properties than Options 1 and 3. The significance of effect would be slight adverse.

Option 5 – Junction 8 signalisation and localised widening at Windhover Roundabout, and full NMU facilities as well as a tunnel under Windhover Roundabout

7.7.20 This option includes the same improvements to M27 Junction 8 as Options 1, 2 and 4. The variation to this option is the construction of a tunnel under the Windhover Roundabout to link the A3024 to A3024 Bursledon Road.

7.7.21 It is likely that tunnelling under Windhover Roundabout would result in extensive loss of woodland cover to accommodate the widening and improvement works to the existing carriageway. Although it may be necessary to remove existing woodland along route of the tunnel through Windhover roundabout, it may be feasible to undertake some replacement planting with shallow rooting shrub species above the tunnel to mitigate the loss of woodland cover.

7.7.22 The magnitude of impact on views from nearby residential receptors and people working at or visiting the adjacent commercial premises is likely to be moderate adverse and temporary during construction due to the large scale works. At operation the magnitude of impact would be minor following reinstatement planting and seeding reducing to negligible when replacement planting had established after approximately fifteen years.

7.7.23 The magnitude of landscape impact from Option 5 would be minor adverse; damage to existing landscape character and features would be noticeable and the new tunnel would be distinguishable the existing road infrastructure. The significance of effect on the Netley, Bursledon and Hamble Coastal Plain LCA[152], which has low sensitivity, would be slight adverse and not significant. Adverse landscape impacts could be mitigated with woodland (screen) planting within the highway boundary.

7.7.24 There would be no direct or indirect impacts on the townscape adjacent to Option 5 and the effect would be neutral.

7.7.25 Option 5 would cause an obvious deterioration in the overall composition of views from the small number of nearby residential properties due to the new road infrastructure and loss of woodland cover within Windhover roundabout. Overall, the magnitude of visual impact is likely to be Moderate. The visual effect is likely to be Moderate adverse and significant. However, visual effects could be mitigated with substantial areas of replacement woodland planting.

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[151] Non-Motorised User
[152] Landscape Character Area

7.7.26 The effects of the options of Sub-scheme 1 are summarised in **Table 7-1**.

Table 7-1 Sub-scheme 1 Summary of Effects

Sub-scheme	Options	Impact		
		Landscape	Townscape	Visual
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades	Option 1: Localised Junction Widening and: Option 3: Free-flow left-turn slip-lanes at M27 Junction 8	Slight Adverse	Neutral	Slight Adverse
	Option 2: Through-about to A3024 Bursledon and: Option 4: Through-about to A3025 Hamble Lane	Moderate Adverse	Neutral	Moderate Adverse
	Option 5: Tunnel under Windhover Roundabout	Slight Adverse	Neutral	Moderate Adverse

SUB-SCHEME 2: A3024 EASTERN ACCESS CORRIDOR

Level 1 Signal Control Improvements

7.7.27 Level 1 improvements comprise UTC[153] and traffic signal controller reconfiguration at signalised junctions to enable GO[154] to eliminate running side roads for longer green times than required. As there would be no change to the existing kerb lines and traffic signal infrastructure there would be no impacts on the adjacent townscape and the effect would be neutral. Similarly, there would be no effects on views or visual amenity.

Level 2 Junction and Signal Improvements

7.7.28 Level 2 improvements comprise introduction of UTMC[155] MOVA[156] signal control at signalised junctions with ability to switch to UTC[157] control if conditions require. Minor changes to kerblines at junctions (introducing flares and turning pockets) to improve localised stop-line capacity.

Level 3 Dualling Full A3024 Corridor

7.7.29 Several offsite mature trees near to the Level 3 improvements could be damaged by the Level 3sub-scheme and would require careful protection during construction and long term monitoring to ensure they are retained in a health condition in the long term. Replacement tree and shrub planting on the northern side of the A3024 would be necessary to reinstate the verdant character of this section of the route.

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[153] Urban Traffic Control
[154] Gap Out
[155] Urban Traffic Management Control
[156] Microprocessor Optimised Vehicle Actuation
[157] Urban Traffic Control

7.7.30 Carriageway widening will result in the loss of some tree and shrub vegetation from areas adjoining the highway boundary would be noticeable and could affect vegetation that screens views from some nearby residential properties. In some locations residential receptors would experience loss of privacy due to the proximity of the traffic and pedestrians.

7.7.31 The level of negative landscape and visual impacts on non-residential properties adjoining sub scheme 2 would depend on the extent of trees and shrubs removed and the amount of replacement planting undertaken. It will also depend on the design of the replacement boundary fencing and walls, which could provide an opportunity for townscape enhancement.

7.7.32 Potential landscape impacts from road widening between Botley Road and Windhover roundabout would arise where it was necessary to remove existing hedgerows and mature hedgerow trees. The significance of effect on the Netley, Bursledon and Hamble Coastal Plain LCA[158], which has low sensitivity, would be slight adverse and not significant.

7.7.33 Potential townscape impacts would arise from loss of tree and shrub vegetation which would damage the existing character of the townscape near the road, and from the large scale widened road and NMU facilities. The magnitude of direct or indirect impacts on the townscape adjacent to sub scheme 2 are likely to be moderate adverse. The significance of effect would be moderate adverse.

7.7.34 The magnitude of visual impacts on adjoining residential properties would be moderate, the new two lane dual carriageway and NMU facilities junction would become the dominant feature of the view and could not be mitigated. The visual effect is likely to be moderate adverse and significant in relation to some residential properties.

7.7.35 The effects of the options of Sub-scheme 2 are summarised in **Table 7-2**.

Table 7-2 Sub-scheme 2 Summary of Effects

Sub-scheme	Options	Impact		
		Landscape	Townscape	Visual
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1: Signal control improvements	N/A	Neutral	Neutral
	Level 2: Junction and signal improvements	N/A	Neutral	Neutral
	Level 3: Dualling full A3024 corridor	Slight Adverse	Moderate Adverse	Moderate Adverse

SUB-SCHEME 3: NORTHAM RAIL BRIDGE REPLACEMENT

7.7.36 Sub Scheme 3 comprises four options for widening Northam Rail Bridge to a two lane dual carriageway with some realignment of the adjoining A3024. Sub scheme 3 lies within an urban area and would not be visible from the surrounding rural landscape. Therefore there would be no impacts on landscape character or elements.

[158] Landscape Character Area

Option 1 – New Bridge / Refurbish Existing Bridge

7.7.37 This option proposes to construct a new two lane bridge and footpath cycleway on the north side of the existing bridge, and to strengthen the existing bridge to accept two lanes of traffic in each direction. Most of the existing bridge would be retained and refurbished.

7.7.38 Realignment of the adjoining road and bridge widening would result in the loss of mature trees and shrubs and open space. These trees enhance the street scene and filter views of the road from nearby residential properties. Opportunities for replacement tree planting would be limited by lack of space. Depending on the quality of the bridge design, the townscape could be enhanced by the new bridge.

7.7.39 Residential properties near the northern side of the widened bridge could experience visual intrusion and the visual effects of moving traffic, including loss of privacy due to the proximity of traffic and pedestrians to upper level windows, and the impacts of headlight glare from traffic on the bridge.

7.7.40 The magnitude of impact on townscape near Option 1 is likely to be minor adverse. The significance of effect would be minor adverse and not significant.

7.7.41 The magnitude of visual impacts on a small number of nearby residential properties would be moderate; the new bridge would become the dominant feature of the view and could not be mitigated. The visual effect is likely to be moderate adverse and significant.

Option 2 – New Bridge / Raise and Refurbish Existing Bridge

7.7.42 Under Option 2 a new two lane bridge and footpath cycleway would be constructed on the north side of the existing bridge. The existing bridge would be strengthened to accept two lanes of traffic in each direction and would be raised to increase headroom above the tracks below. The impacts associated with this option would be similar to those identified for Option 1 above.

7.7.43 The magnitude of impact on townscape near Option 2 is likely to be minor adverse. The significance of effect would be minor adverse and not significant.

7.7.44 The magnitude of visual impacts on a small number of nearby residential properties would be moderate; the new bridge would become the dominant feature of the view and could not be mitigated. The visual effect is likely to be moderate adverse and significant.

Option 3A – New Bridge / Demolish and Replace Existing - Close Subway

7.7.45 This option proposes to construct a new two lane bridge with footpath cycleway on the north side of the existing bridge which would replace the existing bridge structure. Adjoining sections of the existing A3024 road would be realigned. The sub-scheme would result in the loss of mature trees and shrubs, and open space.

7.7.46 The new bridge would be slightly wider than the existing structure and nearer to residential properties than Options 1 and 2.

7.7.47 The magnitude of impact on townscape near Option 3A is likely to be minor adverse. The significance of effect would be minor adverse and not significant.

7.7.48 The magnitude of visual impacts for a small number of nearby residential properties would be moderate. Although the new bridge would be the dominant feature of the view for these receptors, the impact could be mitigated to some extent through the aesthetic design of the new bridge. Depending on the design of the bridge, the visual effect is likely to be slight to moderate adverse.

Option 3B – New Bridge / Demolish and Replace Existing - Retain Subway

7.7.49 This option is broadly similar to Option 3A; however, it retains the subway on the eastern side of the railway line.

7.7.50 The magnitude of impact on townscape would be the same as Option 3A and likely to be minor adverse. The significance of effect would be minor adverse and not significant.

7.7.51 The magnitude of visual impact for a small number of nearby residential receptors, where the new bridge would be the dominant feature of the view, would be would be similar to Option 3A. Depending on the aesthetic design of the bridge, the visual effect is likely to be slight to moderate adverse.

7.7.52 The effects of the options of Sub-scheme 3 are summarised in **Table 7-3**.

Table 7-3 Sub-scheme 3 Summary of Effects

Sub-scheme	Options	Impact		
		Landscape	Townscape	Visual
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1: New bridge / Refurbish existing	N/A	Minor adverse	Moderate adverse
	Option 2: New bridge / Raise and refurbish existing	N/A	Minor adverse	Moderate adverse
	Option 3A: New bridge / Demolish and replace existing - close subway	N/A	Minor adverse	Moderate adverse
	Option 3B: New bridge / Demolish and replace existing - retain subway	N/A	Minor adverse	Moderate adverse

SUB-SCHEME 5: BITTERNE RAIL BRIDGE WIDENING

7.7.53 The proposed sub-scheme is to provide a minimum of 2 lanes per peak direction across the bridge, which is currently narrow and operates as a single wide lane per direction. Because Sub scheme 5 lies within an urban area and would not be visible from the surrounding rural landscape there would be no impacts on landscape character or elements.

Option 1 - Tidal Flow Gantry System

7.7.54 Option 1 would comprise a tidal flow (lane control) system using traffic signals mounted on gantries over the road, and would require no road or bridge widening and no land take, and would have no direct or indirect townscape impacts.

7.7.55 This option is considered to have a neutral impact on townscape. The impact on views and visual amenity would also be neutral

Option 2 - Widening of Existing Bridge

7.7.56 This option would widen the existing bridge to provide two full lanes of traffic per direction. The widening is proposed to the north only (minimising land take impact) by means of replacing the edge beams and adding on a widened section to the existing deck. It would require additional land outside the Hampshire CC highway boundary and result in the loss of mature trees and shrubs and open space. In this location the mature trees contribute to visual amenity and filter views of the road from nearby residential properties. Opportunities for replacement tree planting

would be limited by lack of space. Residential properties near the northern side of the widened bridge could experience visual intrusion and the visual effects of moving traffic.

7.7.57 Widening and realignment of the adjoining A3024 with the new bridge would require new sections of retaining walls on both sides of Bitterne Road West.

7.7.58 The magnitude of impact on townscape near Option 2 is likely to be minor adverse. The significance of effect would be slight adverse and not significant.

7.7.59 The magnitude of visual impacts on a small number of nearby residential properties would be moderate; the new bridge would become the dominant feature of the view and could not be mitigated. The visual effect is likely to be moderate adverse and significant.

Option 3 - Replacement (Widening) of Existing Deck

7.7.60 This option would widen the existing bridge to provide two full lanes of traffic per direction. However, the option would replace the existing deck, replacing it with a new steel composite deck. The widening would occur to the north only (minimising land take impact). Therefore impacts on existing vegetation and visual amenity and opportunities for mitigation would be similar to Option 2.

7.7.61 The magnitude of impact on townscape near Option 3 is likely to be minor adverse. The significance of effect would be slight adverse and not significant.

7.7.62 The magnitude of visual impacts on a small number of nearby residential properties would be moderate; the new bridge would become the dominant feature of the view and could not be mitigated. The visual effect is likely to be moderate adverse and significant. The effects of the options of Sub-scheme 5 are summarised in **Table 7-4**.

Table 7-4 Sub-scheme 5 Summary of Effects

Sub-scheme	Options	Impact		
		Landscape	Townscape	Visual
Sub-scheme 5: Bittern Bridge Widening	Option 1: Tidal flow gantry system	N/a	Neutral	Neutral
	Option 2: Widening of existing bridge	N/a	Slight Adverse	Moderate Adverse
	Option 3: Replacement (widening) of existing deck	N/a	Slight Adverse	Moderate Adverse

ASSESSMENT OF DO MINIMUM/DO SOMETHING SCENARIOS

Do Minimum – Smart Motorways without Scheme

7.7.63 This development option encompasses no sub-scheme options, which would have no direct or indirect impacts on landscape, townscape or visual amenity.

7.7.64 This option is considered to have a neutral impact on landscape and townscape, and on views and visual amenity.

Do Something 1 - Dualling of A3024 Corridor

7.7.65 This development option involves the combination of Sub-scheme 1 Option 1, Sub-scheme 2 Level 3, Sub-scheme 3 Option 3A, and Sub-scheme 5 Option 1.

7.7.66 Signalisation and localised carriageway widening at Windhover Roundabout, M27 Junction 8, Northam Rail Bridge, Bitterne Rail Bridge, and along most of the A3024 corridor as well as new NMU[159] facilities will require areas of additional land from outside the Hampshire CC highway boundary. The widened A3024 road and rail bridges will result in a noticeable increase in the scale of the transport infrastructure which will be noticeable in areas where the townscape is characterised by 20th century terraced and semi-detached housing. This will result in the loss of some residential properties and/or front gardens, as well as land within commercial and business premises and open space.

7.7.67 Mature trees and shrubs and open space will be lost from within and outside the highway boundary with limited opportunities for replacement planting due to lack of available space. Loss of mature street trees will have an adverse impact on townscape character and visual amenity. Overall, there is likely to be a net loss of woodland planting and grassland.

7.7.68 Effects on residential properties near the widened A3024 and bridges are likely to include visual intrusion, views of moving traffic, loss of privacy due to the proximity of traffic and pedestrians to upper level windows, and the impacts of headlight glare from traffic on the bridge.

7.7.69 Overall it is considered likely that this option would have a moderate adverse impact on landscape and townscape and on views and visual amenity.

Do Something 2 Option

7.7.70 This development option involves the combination of Sub-scheme 1 Option 1, Sub-scheme 2 Level 1, Sub-scheme 3 Option 3A, and Sub-scheme 5 Option 1. This is similar to the Do Something 1 Option, but includes Sub-scheme 2 level 1, as opposed to Level 3.

7.7.71 Signalisation and localised carriageway widening at Windhover Roundabout, M27 Junction 8, Northam Rail Bridge, Bitterne Rail Bridge, and the A3024 corridor as well as new NMU[160] facilities, which would require additional land outside of the Hampshire CC highway boundary. This will result in the loss of some residential properties and/or front gardens, as well as land within commercial and business premises and open space.

7.7.72 Effects on residential properties near the widened A3024 and bridges are likely to include visual intrusion, views of moving traffic, loss of privacy due to the proximity of traffic and pedestrians to upper level windows, and the impacts of headlight glare from traffic on the bridge.

7.7.73 Overall it is considered likely that this Option would have a moderate adverse impact on landscape and townscape and on views and visual amenity.

Do Something 3 – Sub-scheme 1 Only

7.7.74 This development option comprises only Sub-scheme 1, Option 1.

7.7.75 There would be a minor increase in the overall scale of the M27 Junction 5 roundabout and Windhover roundabout from Option 1 through the addition of the new built elements. The new roads, signage etc. would be an incremental increase in road infrastructure which would be barely noticeable or indistinguishable from the existing elements.

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[159] Non-Motorised User
[160] Non-Motorised User

7.7.76 Option 1 would not affect the mature woodland planting within Windhover roundabout, which is locally important for visual amenity, visual screening and for reducing the overall scale of the junction. However, small areas of planting and grassland would be lost elsewhere from within the footprint of the scheme to accommodate the carriageway widening, which could be replaced over time with new planting and seeding.

7.7.77 Overall it is considered likely that this Option would have a minor adverse impact on landscape and townscape and on views and visual amenity.

SUMMARY

7.7.78 Landscape and visual effects associated with Sub-scheme 1 would vary according to the extent of the new infrastructure and loss of mature woodland planting within the highway boundary. Potential impacts would be greatest from Options 2 and 5 due to new infrastructure within Windhover Roundabout which would leave limited areas for new screen planting.

7.7.79 Permanent landscape and visual effects would arise from Sub-scheme Level 3 only; Level 1 and 2 would be barely distinguishable at operation. Under Level 3 road widening would increase the scale of the road which would have a direct landscape and visual impact on several residential properties.

7.7.80 Landscape and visual impact associated with Sub-schemes 3 and 5 would be broadly similar. Whilst there would be potential adverse visual impacts for a small number of residential properties from all of the options, it is likely that the options proposing new structures could have an overall beneficial effect. With good design a new bridge would be more aesthetically pleasing and would contribute to the wider regeneration of the surrounding area.

7.7.81 The effects of the Sub-scheme options are summarised in **Table 7-5**.

Table 7-5 Overall Summary of Effects

Sub-schemes	Options	Construction Impacts	Operation Impacts
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades	Option 1: Localised Junction Widening	Landscape: Slight Adverse	Landscape: Slight Adverse
		Visual: Moderate Adverse	Visual: Slight Adverse
	Option 2: Through-about to A3024 Bursledon	Landscape: Moderate Adverse	Landscape: Moderate Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse
	Option 3: Free-flow left-turn slip lanes at M27 Junction 8	Landscape: Slight Adverse	Landscape: Slight Adverse
		Visual: Moderate Adverse	Visual: Slight Adverse
	Option 4: Through-about to A3025 Hamble Lane	Landscape: Moderate Adverse	Landscape: Moderate Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse
	Option 5: Tunnel under Windhover Roundabout	Landscape: Moderate Adverse	Landscape: Slight Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1: Signal control improvements	Landscape: Slight Adverse	Landscape: Neutral
		Visual: Slight Adverse	Visual: Neutral
	Level 2: Junction and signal improvements	Landscape: Slight Adverse	Landscape: Neutral
		Visual: Slight Adverse	Visual: Neutral
	Level 3: Dualling full A3024 corridor	Landscape: Moderate Adverse	Landscape: Moderate Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse
Sub-scheme 3: Northam Rail	Option 1: New bridge / Refurbish existing	Landscape: Slight Adverse	Landscape: Slight Adverse
		Visual: Slight Adverse	Visual: Moderate Adverse

Sub-schemes	Options	Construction Impacts	Operation Impacts
Bridge Replacement	Option 2: New bridge / Raise and refurbish existing	Landscape: Moderate Adverse	Landscape: Slight Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse
	Option 3A: New bridge / Demolish and replace existing - close subway	Landscape: Moderate Adverse	Landscape: Slight Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse
	Option 3B: New bridge / Demolish and replace existing - retain subway	Landscape: Moderate Adverse	Landscape: Slight Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse
Sub-scheme 5: Bittern Bridge Widening	Option 1: Tidal flow gantry system	Landscape: Slight Adverse	Landscape: Neutral
		Visual: Slight Adverse	Visual: Neutral
	Option 2: Widening of existing bridge	Landscape: Moderate Adverse	Landscape: Slight Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse
	Option 3: Replacement (widening) of existing deck	Landscape: Moderate Adverse	Landscape: Slight Adverse
		Visual: Moderate Adverse	Visual: Moderate Adverse

7.8 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

7.8.1 This preliminary assessment has identified where moderate adverse (significant) visual impacts are likely to arise from one or more options in relation to nearby residential and recreational receptors. The assessment was based on 2D design information and did not include aspects that could have landscape and/or visual effects such as the extent of land required, the location and appearance of new structures and earthworks, lighting etc.

7.8.2 When more design information is available regarding the construction arrangements as well as the alignment, earthworks, structures, lighting etc. a detailed landscape and/or visual impact assessment should be undertaken to understand whether significant effects could be avoided or reduced by changing the design and/or providing landscape mitigation, and if not what significant residual effects would arise.

8 NATURE CONSERVATION

8.1 INTRODUCTION

8.1.1 This section provides a preliminary assessment of potential impacts of the options described in **Section 3** on ecological receptors as a result of the M27 Southampton Junctions scheme. The 'simple' assessment, in accordance with DMRB[161] Volume 11 Section 3 Part 4, considers four sub-schemes and various options within each sub-scheme, and has been completed at an early stage in the design process, when detailed design/construction information is not available.

8.2 ASSESSMENT METHODOLOGY

STUDY AREA

8.2.1 The M27 Southampton Junctions scheme consists of online improvements to roads situated mostly within the built up area of the City of Southampton, as described in **Section 3**. The scheme includes four sub-schemes which together aim to increase capacity on the local network along the A3024 corridor, to make this the main route to the city centre from Junction 8.

8.2.2 Impacts and mitigation of the various options are considered for each sub-scheme, and then an overall assessment is made of the four combinations of elements from each sub-scheme forming the overall Do Minimum / Do Something options, as outlined in **Section 3**.

8.2.3 The term Survey Area is used to denote the envelope encompassing all the sub-scheme options. The term Study Area refers to a wider area beyond the scheme options where biological information was reviewed, as defined in the assessment methodology (**Section 8.2.4**) and shown on **Figure 8-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0013), **Figure 8-2** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0015), and **Figure 8-3** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS - 0014.

DESK STUDY METHODOLOGY

8.2.4 A desk study was undertaken to obtain and review records of protected and notable species and habitats and designated nature conservation sites within defined Study Areas drawn from the outer limit of all sub-scheme options as follows:

- International statutory designated sites – 2 km radial study area surrounding the Survey Area and route of M27 between junctions 5 and 8, extending to a 30 km radius for Special Areas for Conservation (SACs) designated for bats;
- National statutory designated sites – 2 km radial study area surrounding the Survey Area;
- Non-statutory designated sites and local statutory designated sites – 1 km radial study area surrounding the Survey Area; and
- Protected and notable species – 1 km radial study area surrounding the Survey Area.

8.2.5 These Study Areas were considered suitable to account for the zone of influence, which reflects the scale and type of the scheme options. The Study Areas are also based on guidance on

[161] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

undertaking ecological assessment provided in the DMRB[162]. Protected and notable species records[163] were reviewed for the period 2006 to 2016 (a 10 year historical data set).

8.2.6 The designated sites included within this desk study search were as follows:

- SACs[164];
- Special Protection Areas (SPAs) and potential Species Protection Areas (pSPA);
- Ramsar sites;
- Sites of Special Scientific Interest (SSSIs);
- National Nature Reserves (NNRs);
- Local Nature Reserves (LNRs); and
- Sites of Importance for Nature Conservation (SINCs).

8.2.7 The following data sources were used:

- Ordnance Survey mapping;
- A bespoke data search provided by Hampshire Biodiversity Information Centre (HBIC) for a c.1 km radius around all sub-scheme Survey Areas;
- Multi Agency Geographic Information for the Countryside (MAGIC); and
- Publicly available aerial imagery and Google Street View.

8.2.8 Protected and notable habitats and species were considered if they were listed on any of the following pieces of statute or conservation registers:

- Annex 1 or Annex 2 of the Habitats Directive (Council Directive 92/43/EEC);
- Schedules 1, 5 or 8 of the *Wildlife and Countryside Act*, (1981) (as amended);
- Species and Habitats of Principal Importance in England (SPIs and HPIs), Section 41 of the *Natural Environment and Rural Communities Act* (2006);
- Hampshire Biodiversity Action Plan (BAP);
- Birds of Conservation Concern[165];
- Joint Nature Conservation Committee (JNCC) Conservation Designations for UK Taxa spreadsheet containing details of species listed as National Notable, Nationally Rare or Nationally Scarce; and
- Important Hedgerows as defined by The Hedgerows Regulations (1997).

EXTENDED PHASE 1 HABITAT SURVEY

8.2.9 An Extended Phase 1 Habitat Survey was undertaken by a suitably experienced ecologist and full

[162] DMRB (2003). Ecology and Nature Conservation. Volume 11, Section 3, Part 4. http://www.standardsforhighways.co.uk/dmrb/vol11/section3.htm
[163] Hampshire Biodiversity Information Centre (2016). A bespoke data search for the site.
[164] Special Areas for Conservation
[165] Eaton et al. (2015). 'Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man.' *British Birds*. 108: 708 – 746.

member of the CIEEM[166] on 26 August 2016. The survey was carried out on the parts of the Survey Area where options were proposed consisting of construction works outside of the existing kerbline. A brief walk-through or drive-through was also undertaken of the parts of the Survey Area where no works were proposed outside of the kerblines, to confirm that no habitats were present within the kerbline.

8.2.10 The Phase 1 Habitat Survey followed standard methodology published by the JNCC[167]. This methodology is a standardised technique for rapidly obtaining baseline ecological information over a large area of land. All habitat types present on site were recorded and dominant plant species were recorded in accordance with standard nomenclature.

8.2.11 In accordance with best practice, the standard survey methodology was extended to consider and include evidence of, or potential for, protected and notable species. Any incidental records or evidence of protected or notable species were noted and each habitat was evaluated for its potential to support protected or notable species, taking into consideration biological records for species in the area.

ASSESSMENT OF IMPACTS

8.2.12 Assessment of impacts was carried out using the guidelines for EcIA[168] produced by CIEEM[169] and DMRB[170] guidelines for nature conservation[171]. A more detailed description of the assessment methodology is included in a separate Preliminary Ecological Appraisal (PEA) report[172].

8.2.13 Important Ecological Features (IEFs) with potential to be affected by the scheme were categorised by geographical level of importance (or sensitivity). The importance of the feature was determined within a geographical context on the following basis:

- International;
- National (England);
- Regional (South East);
- County (Hampshire County);
- Local (Southampton); and
- Site (i.e. within the Survey Area).

8.2.14 **Table 8-1** (adapted from criteria proposed by Ratcliffe[173]) outlines the general criteria taken into consideration for evaluating the importance of both habitats (including designated sites) and

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[166] Chartered Institute of Ecology and Environmental Management.
[167] JNCCJoint Nature Conservation Committee (2010) 'Handbook for Phase 1 habitat survey: a technique for environmental audit.'
[168] Guidelines for Ecological Impact Assessment (EcIA) produced by the Chartered Institute of Ecology and Environmental Management (CIEEM); (2016).
[169] CIEEM (2016) 'Guidelines for ecological impact assessment in the UK and Ireland: terrestrial, freshwater and coastal'. Second Edition. January 2016.
[170] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[171] DMRB (2003). Ecology and Nature Conservation. Volume 11, Section 3, Part 4. http://www.standardsforhighways.co.uk/dmrb/vol11/section3.htm
[172] WSP|PB (2016) 'M27 Southampton Junctions: Preliminary Ecological Appraisal'.
[173] Ratcliffe, D.A. *ed* (1989) 'Guidelines for selection of biological SSSIs'. Peterborough, Nature Conservancy Council.

species in this assessment.

8.2.15 Given the preliminary nature of design information, the fact that this assessment is not based on detailed species and habitat survey work, and that access could not be obtained to parts of the Survey Area, precautionary assumptions have been applied to the presence and value of the baseline information. Features have been classified on a 'reasonable worst case' basis. Where a precautionary classification has been undertaken this is fully justified in the PEA[174].

Table 8-1 Criteria to be Considered when Identifying Geographic Level of Importance of Important Ecological Features

Importance	Criteria
International (European)	**Habitats** An internationally designated site or candidate site (SPA, provisional SPA, SAC[175], candidate SAC, Ramsar Site, Biogenetic/Biosphere Reserve, World Heritage Site) or an area that would meet the published selection criteria for designation. A viable area of a habitat type listed in Annex I of the Habitats Directive, or smaller areas of such habitat, which are essential to maintain the viability of a larger whole. **Species** Any regularly occurring population of internationally important species, threatened or rare in the UK (e.g. a UK Red Data Book species or a species listed on Section 41 of the Natural Environment and Rural Communities (NERC) Act or of uncertain conservation status or of global conservation concern as defined by the International Union for Conservation of Nature (IUCN). A regularly occurring species population which exceeds or approaches the threshold for national importance.
National	**Habitats** A nationally designated site, SSSI[176], NNR[177], Marine Nature Reserve (MNR) or a discrete area, which would meet the published selection criteria for national designation (e.g. SSSI selection guidelines). A viable area of a priority habitat identified in Section 41 of the NERC Act, or smaller areas of such habitat essential to maintain wider viability. **Species** A regularly occurring, regionally or county significant population / number of an internationally/nationally important species. Any regularly occurring population of a nationally important species, threatened or rare in the region or county (consult the Local Biodiversity Action Plan (LBAP) or relevant guidelines for selection of county wildlife sites). A feature identified as of principal importance in Section 41 of the NERC Act (SPIs).
Regional	**Habitats** Sites that exceed the county-level designations, but fall short of SSSI selection criteria. Viable areas of key habitat identified in the regional LBAP or smaller areas of habitat essential to maintain wider viability. **Species** Any regularly occurring, locally significant population of a species listed as being nationally scarce, which occurs in 16 of 100 10 km^2 in the UK or in a regional BAP. A regularly occurring, locally significant population/number of a regionally important species. Sites maintaining populations of internationally/nationally important species that are not threatened or rare in the region or county.

[174] WSP|PB (2016) 'M27 Southampton Junctions: Preliminary Ecological Appraisal'.
[175] Special Areas for Conservation
[176] Sites of Special Scientific Interest
[177] National Nature Reserves

Importance	Criteria
Authority Area (e.g. County or District)	**Habitats** Sites recognised by local authorities, e.g. Sites of Importance for Natural Conservation (SINCs) and Sites of Ecological or Geographical Interest (SEGIs). County / district sites that the designating authority has determined meet the published ecological selection criteria for designation, including LNR[178]. A viable area of habitat identified in county / district BAP. A diverse and / or ecologically valuable hedgerow network. Semi-natural ancient woodland greater than 0.25 ha. **Species** Any regularly occurring, locally significant population of a species listed in a county/district BAP due to regional rarity or localisation. A regularly occurring, locally significant population of a county/district important species. Sites supporting populations of internationally/nationally/regionally important species that are not threatened or rare in the region or county, and not integral to maintaining those populations. Sites/features scarce in the county/district or that appreciably enrich the county/district habitat resource.
Local	**Habitats** Areas of habitats that appreciably enrich the local habitat resource (e.g. species-rich hedgerows, ponds). Sites that retain other elements of semi-natural vegetation that, due to their size, quality or the wider distribution within the local area, are not considered for the above classifications. **Species** Populations/assemblages of species that appreciably enrich the biodiversity resource within the local context. Sites supporting populations of county/district important species that are not threatened or rare in the region or county, and are not integral to maintaining those populations.
Site	**Habitats** Areas of habitat that enrich the habitat resource of the site, but are not of local importance on account of factors such as quality, extent or isolation. **Species** Populations/assemblages of species that enrich the biodiversity resource within the site, but are not of local importance on account of the small size of the population or other factor. Sites supporting populations of locally important species that are not threatened or rare locally, and are not integral to maintaining those populations.
Negligible	No intrinsic ecological value.

8.2.16 The characteristics and scale of potential impacts of the options on each IEF[179] were then assessed, and the geographic level at which the effect is significant is stated. It should be noted that in line with the guidance issued by CIEEM[180], an impact which has been considered as significant in ecological terms is the same as significant in ESR[181] terms. The assessment of effect takes into consideration the following parameters: positive/negative effect, magnitude, extent, duration, reversibility, and timing/frequency. The impact assessment was made assuming that design, embedded mitigation and standard construction practice measures are implemented.

8.2.17 Further mitigation recommendations are made to avoid, mitigate or compensate for the potential impacts. The significance of any residual impacts were then assessed to determine whether the

[178] Local Nature Reserves
[179] Important Ecological Feature
[180] Chartered Institute of Ecology and Environmental Management
[181] Environmental Study Report

impacts would result in a significant effect on the IEF once recommended mitigation was implemented.

8.3 BASELINE CONDITIONS

DESK STUDY FINDINGS

8.3.1 Desk study findings relating to designated sites, HPIs[182] and SPIs[183] are reported in this section. More detail on the records for protected species and SPIs are reported within the separate PEA[184] report[185].

STATUTORY DESIGNATED SITES

8.3.2 Four internationally designated sites are located within 2 km of the Survey Area and within 2 km of the M27 between Junctions 5 and 8: River Itchen SAC[186]; Solent Maritime SAC; Solent and Southampton Water SPA; and Solent and Southampton Water Ramsar site (**Figure 8-1** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0013).

8.3.3 At their closest point, the Solent and Southampton Water SPA[187] and Ramsar sites are located adjacent to the A3024 where the Northam River Bridge crosses over the River Itchen, and are c.150 m to the south of the nearest construction location at Sub-scheme 5. This area also forms the Lee-on-the-Solent to Itchen Estuary SSSI[188]. The Ramsar site is designated as an internationally important wetland characteristic of the region and also, as it supports an important assemblage of rare plants and invertebrates, a peak winter waterfowl count of international importance and populations of the following bird species occurring at levels of international importance: ringed plover (*Charadrius hiaticula*), dark-bellied brent goose (*Branta bernicla bernicla*), Eurasian teal (*Anas crecca*), and black-tailed godwit (*Limosa limosa islandica*). The SPA is designated for supporting a waterfowl assemblage of international importance and for supporting populations of European importance including breeding: Mediterranean gull (*Larus melanocephalus*), little tern (*Sterna albifrons*), roseate tern (*Sterna dougallii*), common tern (*Sterna hirundo*), and sandwich tern (*Sterna sandvicensis*); and overwintering: ringed plover, dark-bellied brent goose, Eurasian teal, and black-tailed godwit.

8.3.4 The River Itchen SAC (which also forms the River Itchen SSSI) is crossed by the M27 between Junctions 5 and 7, and is c. 2.4 km to the north of Sub-scheme 5. The SAC is designated for the presence of Annex I habitat: “water course of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation”; and Annex II species: bullhead (*Cottus gobio*) and southern damselfly (*Coenagrion mercuriale*).

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[182] Habitats of Principal Importance
[183] Species of Principal Importance
[184] Preliminary Ecological Appraisal
[185] WSP|PB (2016) ‘M27 Southampton Junctions: Preliminary Ecological Appraisal’.
[186] Special Areas for Conservation
[187] Special Protection Areas
[188] Sites of Special Scientific Interest

8.3.5 The closest point of the Solent Maritime SAC is situated c.1.2 km to the south east of Sub-scheme 1, and is crossed by the M27 at the River Hamble between Junctions 8 and 9. It is designated for the presence of Annex I habitats: estuaries, spartina swards, and Atlantic salt meadows. The eastern part of the Upper Hamble Estuary and Woods SSSI lies within the SAC, and the western part of the SSSI is c. 580 m to the east of Sub-scheme 1. The SSSI is designated as saltmarsh, reedswamp and semi-natural ancient woodland. The southern part of the SAC, c.1.9 km to the south east of Sub-scheme 1, also forms Lincegrove and Hackett's Marshes SSSI, designated as a mature saltmarsh.

8.3.6 Two SACs designated for bats were identified within 30 km of the sub-schemes (see **Figure 8-2** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0015). Mottisfont Bats SAC, designated for its population of barbastelle bat (*Barbastella barbastellus*), is located c.18 km to the north west of Sub-scheme 3 and separated from it by the peripheries of the City of Southampton, the town of Romsey and several major roads. Briddlesford Copses SAC, designated for its population of Bechstein's bat (*Myotis bechsteini*), is located on the Isle of Wight c.20 km to the south east of Sub-scheme 1 and separated from it by The Solent.

8.3.7 The Solent and Dorset Coast pSPA[189] (**Figure 8-1** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0013) has also been proposed around the coast to the south of Southampton and extending up the River Itchen and under the A3024 Northam River Bridge. The pSPA lies adjacent to the existing Solent and Southampton Water SPA[190] within the River Itchen in the vicinity of Sub-scheme 2 and 5. It is proposed to cover sub-tidal areas not currently encompassed by existing SPAs, and would be designated as an important area of foraging habitat for three breeding species of tern (little tern, common tern and sandwich tern). These species are also covered under the existing adjacent intertidal Solent and Southampton Water SPA. The pSPA is currently undergoing consultation.

[189] potential Special Protection Area
[190] Special Protection Area

Figure 8-1 Statutory designated sites for nature conservation

HE551514-WSP-GEN-M27-F1-GIS-0013

Figure 8-2 Special Area of Conservation Designated for Bats

8.3.8 Southampton Common SSSI[191] is the only additional nationally designated site (not also forming part of an internationally designated site). It is situated c.1.8 km to the north west of Sub-scheme 3 and is designated as it supports large amphibian populations, including one of the largest known populations of great crested newt in the UK.

8.3.9 Four LNRs[192] are located within the Study Area (**Figure 8-1** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0013) as follows:

- Chessel Bay LNR is situated c.150 m to the south of Sub-scheme 5 and forms part of the Solent and Southampton Water SPA[193] and Ramsar site. It is described as the only remaining long stretch of natural undeveloped shoreline in the lower Itchen River, including mudflats which provide a feeding ground for wading birds and wildfowl (in particular oystercatcher), a strip of shingle and saltmarsh, and a parallel narrow strip of woodland which runs along the railway line at the north eastern boundary of the site;
- Netley Common LNR is situated c.350 m to the north east of Sub-scheme 2 and forms an open heathland surrounded by a woodland fringe, and including Netley Common Hound Site of Importance for Nature Conservation (SINC) and Netley Common Southampton SINC, (see non-statutory designated sites);
- Manor Farm LNR is situated c.350 m to the east of Sub-scheme 1, described as supporting roe deer, curlews, skylarks and an array of wildflowers, insects and reptiles; and
- Millers Pond LNR is situated c.600 m to the south west of Sub-scheme 2, described as semi-natural woodland and wildlife areas including a pond and acid grassland, forming an important green open space.

NON-STATUTORY DESIGNATED SITES

8.3.10 There are a total of 30 non-statutory designated SINCs[194] within 1 km of the sub-schemes, as shown in **Table 8-2**, (see also **Figure 8-3** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS - 0014). Of these, two SINCs are partly included within the scheme Survey Area itself: Windhover (Netley Common South) SINC and Sholing Common SINCs. Five sites are located within 10 m of the scheme, including two immediately adjacent to Sub-scheme 2 areas of construction: Shoreburs Greenway and Oakleigh Meadow SINCs; and three more distant from construction areas: River Itchen Mudland; Bitterne Manor; and Hum Hole.

Table 8-2 Non-statutory designated sites within the Study Area

Site Name	Description	Distance from scheme (to nearest 10 m, or to nearest 1m if within 10 m of Sub-scheme (SS))
Sholing Common SINC	Semi-improved grassland with significant element of unimproved grassland; and of high social value to local communities.	0 m to SS2 (southern c.7 m of SINC is within Survey Area of SS2)
Windhover (Netley Common South) SINC	Areas of heathland vegetation; and areas of afforested heathland which retain significant remnants of heathland vegetation which would enable their recovery.	0 m to SS2 (southern c.5 m of SINC is within Survey Area of SS2)

[191] Sites of Special Scientific Interest
[192] Local Nature Reserves
[193] Special Protection Areas
[194] Sites of Importance for Nature Conservation

Site Name	Description	Distance from scheme (to nearest 10 m, or to nearest 1m if within 10 m of Sub-scheme (SS))
Oakleigh Meadow SINC[195]	Semi-improved grassland with significant element of unimproved grassland.	0 m to SS1 (bounds south eastern corner of SS1)
Shoreburs Greenway SINC	Woodland with significant element of ancient semi-natural woodland; and other semi-natural woodland of restricted distribution in the county; semi-improved grassland with significant element of unimproved grassland; supports one or more notable species; and of high social value to local communities.	1 m to south of SS2 in northern part of SINC, and 6 m to south west of SS2 in southern part of SINC
Hum Hole SINC	Woodland with significant element of ancient semi-natural woodland; supports one or more notable species; and of high social value to local communities.	2 m to north of SS2
Bitterne Manor SINC	Semi-natural coastal and estuarine habitats; and of high social value to local communities.	2 m to north of SS2
River Itchen Mudland SINC	Semi-natural coastal and estuarine habitats.	2 m to north of SS2 at Northam River Bridge
Peewit Hill SINC	Areas of heathland vegetation; areas of afforested heathland which retain significant remnants of heathland vegetation which would enable their recovery; and supports one or more notable species.	180 m to north of SS1
Durncomb's Copse Meadow SINC	Semi-improved grassland with significant element of unimproved grassland.	180 m to east of SS1
Montgomery Way SINC	Site of high social value to local communities.	200 m to north of SS2
Freemantle Common SINC	Semi-improved grassland with significant element of unimproved grassland; and of high social value to local communities.	250 m to south of SS2
Piland's Copse SINC	Ancient semi-natural woodland.	300 m to north east of SS1
Netley Common, Southampton SINC	Areas of heathland vegetation; areas of afforested heathland which are contiguous with or form an integral part of an open area of heathland; semi-improved grassland with significant element of unimproved grassland; and fens, flushes, seepages, springs, inundation grasslands etc. that support a flora and fauna characteristic of unimproved and waterlogged conditions.	350 m to north east of SS2

[195] Sites of Importance for Nature Conservation

Site Name	Description	Distance from scheme (to nearest 10 m, or to nearest 1m if within 10 m of Sub-scheme (SS))
Durncomb's Copse SINC	Woodland with significant element of ancient semi-natural woodland.	370 m to east of SS1
Windmill Fields Wood SINC	Woodland with significant element of ancient semi-natural woodland.	390 m to south of SS1
Dumbleton's Copse SINC	Areas of afforested heathland which are contiguous with or form an integral part of an open area of heathland.	420 m to north east of SS2
Netley Common, Hound SINC	Semi-improved grassland with significant element of unimproved grassland; areas of heathland vegetation; areas of afforested heathland which are contiguous with or form an integral part of an open area of heathland; and fens, flushes, seepages, springs, inundation grasslands etc. that support a flora and fauna characteristic of unimproved and waterlogged conditions.	430 m to north east of SS2
Weston Greenway SINC	Ancient semi-natural woodland; woodland with significant element of ancient semi-natural woodland; and other semi-natural woodland of restricted distribution in the county.	520 m to south west of SS2
Sandpit Copse SINC	Ancient semi-natural woodland.	580 m to east of SS1
Saxon Wharf/Shamrock Quay SINC	Semi-natural coastal and estuarine habitats.	590 m to south of SS5
Thornhill Park Plantation SINC	Woodland with significant element of ancient semi-natural woodland; and of high social value to local communities.	600 m to north east of SS2
Riverside Park SINC	Other semi-natural woodland of restricted distribution in the county; semi-natural coastal and estuarine habitats; and of high social value to local communities.	730 m to north of SS5
Land North of Bridge Road SINC	Semi-improved grassland with significant element of unimproved grassland.	740 m to south of SS1
Harefield Copse SINC	Woodland with significant element of ancient semi-natural woodland	780 m to north east of SS2
Piland's Wood (Upper) SINC	Ancient semi-natural woodland; and other semi-natural woodland of restricted distribution in the county.	800 m to south of SS1
Netley Hill Heath SINC	Areas of heathland vegetation; areas of afforested heathland which retain significant remnants of heathland vegetation which would enable their recovery.	800 m to north east of SS2
Peartree Green SINC	Semi-improved grassland with significant element of unimproved grassland or sufficient relicts to enable recovery; supports one or more notable species; and of high social value to local communities.	850 m to south east of SS3

Site Name	Description	Distance from scheme (to nearest 10 m, or to nearest 1m if within 10 m of Sub-scheme (SS))
Itchen Bridge Mudflat SINC	Semi-natural coastal and estuarine habitats.	860 m to south of SS3
Braeside Road Woodland SINC	Ancient semi-natural woodland; and of high social value to local communities.	910 m to south of SS2
South West of Exeter Close SINC[196]	Site of high social value to local communities.	780 m to north of SS2

[196] Sites of Importance for Nature Conservation

Figure 8-3 Non-statutory designated sites for nature conservation

HE551514 - WSP - GEN - M27 - FI - GIS – 0014

PROTECTED AND NOTABLE SPECIES

8.3.11 Species recorded in the biological records for the Study Area, and with potential to be present within the Survey Area and affected by the proposals included:

- Breeding birds including SPIs[197] such as house sparrow (*Passer domesticus*), dunnock (*Prunella modularis*), linnet (*Carduelis cannabina*), song thrush (*Turdus philomelos*), spotted flycatcher (*Muscicapa striata*), and starling (*Sturnus vulgaris*);
- Reptiles including adder (*Vipera berus*), common lizard (*Zootoca vivipara*) and slow worm (*Anguis fragilis*);
- Bat species including brown long-eared (*Plecotus auritus*), noctule (*Nyctalus noctula*) and pipistrelle (*pipistrellus sp.*);
- Badger (*Meles meles*);
- Hazel dormouse (*Muscardinus avellanarius*);
- West European hedgehog (*Erinaceus europaeus*); and
- Invertebrates – numerous species including SPIs such as stag beetle (*Lucanus cervus*), cinnabar moth (*Tyria jacobaeae*) and small heath butterfly (*Coenonympha pamphilus*).

HABITATS OF PRINCIPLE IMPORTANCE

8.3.12 Two HPIs[198] were included in the records provided by HBIC[199] within the Survey Area. Lowland mixed deciduous woodland was recorded within Sub-schemes 1 and 2 at various points, and a small area of dry heathland was recorded within the edge of a c.10 m length of Sub-scheme 2, in the south west corner of Windhover (Netley Common South) SINC.

8.3.13 Other HPIs were recorded immediately adjacent to the Survey Area including: lowland meadows adjacent to Sub-scheme 1; wet woodland adjacent to Sub-scheme 2; and intertidal mudflats adjacent to Sub-scheme 2.

PHASE 1 HABITAT SURVEY

8.3.14 The Survey Area supported eleven habitat types. **Table 8-3** lists the habitats present in each sub-scheme Survey Area. They are mapped on the Phase 1 Habitat Survey plans (**Figure 8-4** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0016 **Sheets 1 to 16**). A more detailed description of each habitat type is included in the separate PEA report[200]. All sub-scheme Survey Areas consisted mostly of hard standing (tarmac/concrete) forming the existing A3024 road, with narrow strips of habitat either side.

[197] Species of Principal Importance
[198] Habitats of Principal Importance
[199] Hampshire Biodiversity Information Centre
[200] WSP|PB (2016) 'M27 Southampton Junctions: Preliminary Ecological Appraisal'.

ECOLOGICAL VALUE

8.3.15 Of the recorded habitats, two form HPIs[201] and are therefore considered as IEFs[202]: semi-natural broad-leaved woodland; and hedgerows. As the hedgerows were species poor and gappy in places, they are considered to be of local importance due to their relatively poor quality. The woodlands were also considered to be of local importance in Sub-schemes 1 and 2 where they mostly formed small parts of larger wooded areas. In Sub-scheme 5 the wooded habitat was classed as of site importance only as it formed a fairly small and isolated patch of recently developed woodland, including non-native species such as sycamore, within an urban area.

8.3.16 Other habitats were assessed for importance only in relation to their potential function in supporting protected and notable IEF species as listed in **Table 8-3** below (see **Section 8.3.17)**.

Table 8-3 Phase 1 habitat types within each sub-scheme

Habitat Type	Sub-Scheme (✓ = habitat present)			
	1	2	3	5
Semi-natural broadleaved and mixed woodland	✓	✓		✓
Plantation broadleaved woodland	✓			
Scattered trees/tree line (including Tree Preservation Order (TPO) trees)	✓ (TPO: 110-A1)	✓ (TPO: T2-370, T2-125, T2-578)	✓	✓ (TPO: T2-351)
Dense/continuous scrub/scattered scrub	✓	✓	✓	✓
Ornamental shrubs	✓	✓	✓	
Poor semi-improved grassland		✓		
Improved grassland		✓	✓	✓
Arable (allotments)		✓		
Amenity grassland	✓	✓	✓	✓
Species-poor hedgerow	✓	✓		
Buildings		✓		

[201] Habitats of Principal Importance
[202] Important Ecological Features

Figure 8-4 Phase 1 Habitat Survey plans

PROTECTED / NOTABLE SPECIES

8.3.17 The Survey Area and adjacent habitats have the potential to support various protected and notable species. The species records collated during the desk study and habitat assessments undertaken during the Extended Phase 1 Habitat Survey were used to create **Table 8-4,** summarising the potential for presence of protected and notable species in or immediately adjacent to the Survey Area.

8.3.18 No targeted species surveys have been undertaken, and these surveys would be required to confirm presence or likely absence of species in each area.

Table 8-4 Potential for Presence of Protected/Notable Species within or adjacent to each Sub-scheme

Species/species group	Sub-Scheme (✓ = potential for species to be present)			
	1	2	3	5
Badger	✓	✓		
Bats - roosting	✓	✓		✓
Bats - foraging	✓	✓	✓	✓
Breeding birds	✓	✓	✓	✓
Dormouse	✓	✓		
Great crested newt - foraging	✓	✓		
Hedgehog	✓	✓	✓	✓
Invertebrates	✓	✓		
Reptiles	✓	✓	✓	✓
Non-native invasive plants	✓			✓

8.4 VALUE (SENSITIVITY) OF RESOURCE

8.4.1 IEFs recorded as present or potentially present in each sub-scheme area, which could be affected by the scheme, are categorised in **Table 8-5** by geographical level of importance. The presence of non-native invasive species and TPOs[203] are also noted in **Table 8-5** as features that require mitigation[204] rather than IEFs[205]. For species which have potential to be present, the level of importance is assessed by considering the extent of habitat to be affected by the scheme and therefore the likely maximum size or importance of population or species assemblage which could be affected, taking a precautionary approach. The actual presence of faunal species is currently unknown in the absence of specialist surveys.

[203] Tree Preservation Order

[204] Note: Consultation with the SCC Planning Ecologist (*personal communication* on 28/11/2016) indicated that all highway trees in Southampton are afforded the same level of protection as trees covered by Tree Preservation Orders. Any trees which are removed will be required to be replaced at a ratio of two for every one removed.

[205] Important Ecological Features

8.4.2 Internationally designated sites present in the Study Area were assessed separately in Assessments of Implications on European Sites (AIESs)[206]. Four of the six sites were found to be unlikely to be affected by the scheme and did not require mitigation; therefore these are excluded from **Table 8-5** below. Only the Solent and Southampton Water SPA[207] and Ramsar sites (and adjacent Solent and Dorset Coast pSPA[208]) are included as being potentially affected by the scheme.

Table 8-5 Geographical level of Importance of Important Ecological Features (and Presence of Invasive Non-native Species and TPO Trees) that could be affected by the Scheme

IEF	Sub-Scheme			
	1	2	3	5
Designated Sites				
Solent and Southampton Water SPA and Ramsar (and adjacent Solent and Dorset Coast pSPA)		**International**		**International**
Chessel Bay LNR[209]				**County**
Millers Pond LNR		**County**		
Sholing Common SINC[210]		**County**		
Windhover (Netley Common South) SINC		**County**		
Oakleigh Meadow SINC	**County**			
Shoreburs Greenway SINC		**County**		
Hum Hole SINC		**County**		
Bitterne Manor SINC		**County**		
River Itchen Mudland SINC		**County**		
Habitats				
Semi-natural broadleaved woodland	**Local**	**Local**		**Site**
Species poor hedgerow	**Local**	**Local**		
Species (and supporting habitats)				
Invertebrates (and poor semi-improved grassland, woodland)	*Site*	*Site*		
Badger (and woodland, scrub, hedgerows, grassland)	*Local*	*Local*		
Dormouse (and woodland, scrub, hedgerows)	*County*	*County*		

[206] WSP|PB (2016) 'Initial Assessment of Implications upon European Sites (AIES)' – completed for Solent and Southampton Water SPA, Solent and Southampton Water Ramsar, Solent Maritime SAC, River Itchen SAC, Mottisfont Bats SAC and Briddlesford Copses SAC.
[207] Special Protection Areas
[208] potential Special Protection Area
[209] Local Nature Reserve
[210] Sites of Importance for Nature Conservation

IEF	Sub-Scheme			
	1	2	3	5
Bats – roosting (and buildings, woodland, trees); foraging (and woodland, hedgerows, tree lines, semi-improved grassland)	*County*	*County*	*Site*	*County*
Breeding birds (and trees, woodland, hedgerows, scrub, shrubs)	*Local*	*Local*	*Local*	*Local*
Reptiles (and woodland, scrub, hedgerows, semi-improved and improved grassland, allotments)	*County*	*County*	*Local*	*Local*
Great crested newt – foraging (and scrub, hedgerows, semi-improved and improved grassland)	*County*	*County*		
Hedgehog (and woodland, scrub, hedgerows)	*Local*	*Local*	*Local*	*Local*
(Non-native invasive plants)	✓			✓
(Trees subject to TPO[211])	✓ *(1 no.)*	✓ *(3 no.)*		✓ *(1 no.)*

Note: The level of importance of IEFs that are confirmed present are shown **in bold**, and those that have potential to be present are shown *in italics.* Non-native invasive plants and trees subject to TPOs are not IEFs and are included in the table only to show where they are present: ✓ = feature present.

8.5 REGULATORY / POLICY FRAMEWORK

8.5.1 The regulatory and policy framework of relevance for this ecological assessment is as follows:

- Wildlife and Countryside Act (1981) (as amended);
- The Conservation of Habitats and Species Regulations (2010) (as amended) (Habitat Regulations);
- The Countryside and Rights of Way Act (2000);
- The Natural Environment and Rural Communities (NERC) Act (2006);
- The Protection of Badgers Act (1992);
- The Hedgerow Regulations (1997);
- National Planning Policy Framework (2012)[212];
- SCC Local Plan[213];
- DMRB[214] 1992 (as amended);
- The UK Post-2010 Biodiversity Framework (2012)[215]; and

[211] Tree Preservation Order
[212] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2
[213] Southampton Local Plan: [online] available at: http://www.southampton.gov.uk/planning/planning-policy/adopted-plans/default.aspx
[214] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[215] UK Post-2010 Biodiversity Framework (2012): [online] available at: http://jncc.defra.gov.uk/page-6189

→ The Hampshire Biodiversity Action Plan[216].

8.5.2 Policies SDP12 (Landscape and biodiversity) and NE5 (Intertidal mudflats) in the Southampton Local Plan, and Policy CS22 (Promoting biodiversity and protecting habitats) in the Core Strategy[217], relate to nature conservation. Policy CS22 describes protection afforded to designated sites and protected species and states that the Council will ensure development: retains and protects features of biological interest; does not adversely affect the integrity of international sites; and is unlikely to have an unacceptable impact on national or local designations. It also states that the Green Grid will be safeguarded to provide a network of wildlife corridors between areas of green space. Policy NE5 states that development will not be permitted which would result in disturbance to intertidal mudflat habitat and land along the River Itchen unless there is no adverse effect on nature conservation interest and no net loss of mudflat habitat.

8.5.3 The biodiversity plan for Hampshire lists all the HPIs[218] and SPIs[219] in Hampshire and includes action plans for specific species and habitats. Habitats subject to the plan include ancient semi-natural woodland, hedgerows, and standing open water.

8.5.4 The Highways England strategy document[220] sets out the HE's biodiversity plan and includes several objectives relevant to this assessment. In particular it aims to achieve 'no net loss' of biodiversity.

8.6 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

INTRODUCTION

8.6.1 At this stage of the assessment process, and without information from detailed surveys or detailed design, only broad recommendations of likely mitigation requirements are possible. Further surveys would be necessary at more detailed stages of design to confirm the exact mitigation requirements necessary for individual options to address specific impacts.

DESIGN AND EMBEDDED MITIGATION

8.6.2 The impact assessment 'in the absence of mitigation', is undertaken assuming that the following design, embedded mitigation and construction practice measures are implemented as standard:

→ The road alignment and widening scheme is designed to affect the minimum necessary area of habitat outside the existing kerblines;

→ Habitat protection measures such as fencing and signage are used to prevent accidental direct adverse impacts to nearby habitats;

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[216] Hampshire Biodiversity Partnership (no date) 'Biodiversity Action Plan for Hampshire' [online] available at: http://www.hampshirebiodiversity.org.uk/vol-one.html (accessed September 2016)
[217] Southampton Local Plan: [online] available at: http://www.southampton.gov.uk/planning/planning-policy/adopted-plans/default.aspx
[218] Habitats of Principal Importance
[219] Species of Principal Importance
[220] Highways England (2015) 'Our plan to protect and increase biodiversity' [online] available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/441300/N150146_-_Highways_England_Biodiversity_Plan3lo.pdf

- Surface water run-off attenuation and treatment features are installed to minimise water discharge to watercourses, and to ensure that any discharge would not compromise the conservation value of the watercourse or the species that live within it; and
- General construction environmental best practice and pollution prevention measures (in accordance with Environment Agency (EA) Pollution Prevention Guidelines) are implemented. This could include, but is not limited to, the damping of haul routes to minimise the spread of dust, the use of drip trays and spill kits when refuelling vehicles.

8.6.3 Once the preferred scheme options/scenario has been confirmed, specialist species/habitats surveys would be required to confirm presence or likely absence of IEFs. These surveys would then enable required mitigation and compensation to be identified, as well as opportunities for enhancement. At this stage, the following mitigation and compensation measures are recommended based on assumptions regarding likelihood of presence of species following the Phase 1 Habitat Survey.

8.6.4 In broad terms, the following hierarchical approach to mitigation should be adopted – this approach is strongly supported by guidance in the DMRB[221] and national planning policy:

- Firstly, measures to avoid adverse ecological impacts (for example the re-siting of construction compounds, or adjustments in road alignment, etc.) should be exhausted;
- Where an adverse impact cannot be avoided, options to ameliorate or reduce an adverse impact should be implemented (e.g. erection of barriers or bunds to reduce noise and vibration; use of Sustainable Drainage Systems (SUDS) to regulate water flows);
- As a last resort, measures that compensate for the loss of the particular ecological resource that is affected should be considered. For example, like-for-like replacement of lost habitats. Compensation approaches may include enhancement of existing habitats by improved management and long-term monitoring.

8.6.5 Recommended mitigation and compensation measures could include the following (depending on the finding of specialist surveys and the scheme options selected):

- Construction practices are modified to minimise working width, and habitat protection measures including protective fences around tree root protection areas and important habitats are implemented to protect immediately adjacent trees and habitats of importance;
- Any woody vegetation clearance is undertaken outside of the nesting season or following a check by a qualified ecologist that nesting birds are not present (where nesting birds were present, their nests would be left intact until completion of the nesting attempt);
- Clearance of dense scrub and hedgerows is undertaken in a directional manner, outside of the hedgehog hibernation period, or following a check that hedgehogs are not present;
- Open trenches are not left over night without safe means of egress for animals that may fall into them;
- Habitat creation/enhancement to compensate for loss of habitat as a result of the scheme either through: the translocation of existing habitats or seed banks; the enhancement of existing retained habitat; and/or the planting of new habitat;
- Translocation and/or exclusion of protected species (under appropriate licences / agreements), where required from the scheme footprint, to pre-prepared receptor sites, to minimise impacts of habitat loss and species mortality;

[221] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

- Appropriate design and use of lighting to minimise impacts on bats and other light sensitive species;
- Re-establishing/maintaining connectivity between habitats affected by road construction and incorporation of features within the detailed design which would restore connectivity for protected species;
- The use of screening during construction to minimise the spread of noise, dust, lighting, etc. and the use of fencing to temporarily exclude species by restricting access into particular areas where necessary (such as reptile exclusion fencing);
- Since all highway trees in Southampton are afforded the same level of protection as trees covered by TPOs, any trees which are removed will need to be replaced at a ratio of two for every one removed. Therefore an arboricultural assessment will be undertaken (at PCF Stage 3) in order to identify any affected highway trees as required;
- Appropriate landscaping and re-landscaping of all new roadside verges and disturbed habitat specifically for species known to be present in the area, and replacement of TPO[222] and other mature trees (where suitable for network and safety priorities). All landscaping should use species of local provenance;
- Japanese Knotweed would be dealt with in the long term/wider context by each respective landowner as part of their current obligations; (that responsibility would fall to Area 3 Asset Support Contract (ASC) Contractor for Highways England's Strategic Road Network (SRN) or the relevant Highway Authority if not Highways England). In addition, a Scheme specific Japanese Knotweed management plan will be implemented to prevent spread and eradicate identified existing stands.

8.6.6 Consideration should be given to using a biodiversity offsetting approach which employs a metric to quantify the area of required compensatory habitat creation (especially if Sub-scheme 2, Level 3 is implemented). A biodiversity offsetting approach may also be used to provide early and effective engagement of offset providers and statutory consultees so that compensatory habitat creation measures contribute to existing biodiversity strategies. It may be that compensatory habitat creation (if required) is best undertaken away from the scheme to achieve the best nature conservation outcomes. Thorough engagement with local biodiversity stakeholders is recommended to facilitate appropriate offsetting, and to reduce the risk of objection from these stakeholders.

8.6.7 Implementation of a Wildlife Construction Plan is recommended prior to and during construction to ensure that the required mitigation measures are followed.

MONITORING AND MANAGEMENT POST-CONSTRUCTION

8.6.8 Implementation of a post-construction monitoring programme is also recommended during the initial maintenance period, to assess establishment of the ecological mitigation measures, help inform future management and, if necessary, allow for the implementation of remedial measures.

8.6.9 An ecology aftercare plan would be developed based on the mitigation provided during the construction stage and the long-term objectives of the mitigation. This plan would be developed during the detailed design stage and finalised during the construction stage. It would provide an auditable record of the various mitigation commitments identified, and the requirements for regular maintenance of the mitigation features to ensure that their goals are achieved. It would feed into the Environmental Masterplan for the scheme, which would be developed in accordance with

[222] Tree Preservation Order

DMRB[223] Volume 10 to show all existing and proposed environmental aspects of the scheme including environmental barriers, proposed planting/seeding and its functions, biodiversity and nature conservation, noise attenuation, heritage conservation and enhancement, flood attenuation, water courses and quality controls. This information would be fed into the Highways England Environmental Database (EnvIS).

8.7 OVERALL ASSESSMENT

INTRODUCTION

8.7.1 This section identifies construction and operation phase impacts that may affect IEFs[224] under each sub-scheme option, and states the likely geographical level of the effect in the absence of mitigation. The assessment of construction effects in the absence of mitigation is presented in **Table 8-6.** A discussion of operational effects is given in Section **8.7.6**.

8.7.2 Residual effects, following implementation of recommended ecological mitigation measures, are then identified and the significance of the residual effect on the IEFs is assessed and summarised by sub-scheme in **Sections 8.7.7** to **8.7.9**.

8.7.3 The four option combination scenarios are then assessed, and the potential construction and operational impacts and residual effects for each scenario are summarised in **Sections 8.7.10** to **8.7.27**. The four scenarios are compared in **Sections 8.7.28** to **8.7.30** to indicate which would have the greatest ecological effects.

8.7.4 The conclusion (**Sections 8.7.31** to **8.7.35**) presents the residual ecological effects under each of the sub-scheme options in **Table 8-7**, and ranks each option according to the level of ecological effect it would cause.

IMPACT ASSESSMENT

8.7.5 Impacts on IEFs[225] are considered for the construction phase in the absence of mitigation in **Table 8-6**. Impacts on non-native invasive species and TPOs[226] are also included.

8.7.6 Operation phase impacts are not expected to result in significant effects on IEFs. This is because the M27 and A3024 are already heavily used roads: the 2014 AADT[227] over 24 hours reported around 34,800 on the A3024 Northam River Bridge over the River Itchen; and c.155,900 vehicles on the M27 between Junctions 5 and 8. Therefore, protected species, habitats and sites in the vicinity are already subject to impacts associated with roads such as fragmentation of habitat, disturbance from traffic noise and lights, air pollution and mortality from collision with vehicles. It is therefore unlikely that increases in traffic from any one scheme option in isolation would have a significant effect on IEFs in the vicinity of the existing road. Potential effects and their likelihood are described in more detail in **Sections 8.7.14** to **8.7.19** for the Do Something 1 scenario for which traffic modelling has been carried out.

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[223] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[224] Important Ecological Features
[225] Important Ecological Features
[226] Tree Preservation Order
[227] Annual Average Daily Traffic

Table 8-6 Geographical Level of Significant Ecological Effects Caused by Construction Impacts in the Absence of Mitigation

Sub-schemes	Options	Designated Sites	Habitats	Protected and notable species (plus Japanese knotweed and TPO trees)
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades	Option 1 : Localised Junction Widening	None	Semi-natural broadleaved woodland: Minor permanent loss of edge of woodland (<0.1ha) – Site Intact species poor hedgerow: Minor permanent loss of hedgerow (up to c.500 m) - Site	Badger: possible damage to setts, harm to animals and permanent loss of foraging habitat – Site Dormouse: loss of potential low quality connecting habitat and harm to individuals – Local Bats: Loss of trees which may have low potential to support roosting bat (Local), and loss of foraging/commuting habitat (Site) Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Great crested newt: minor permanent loss of c.0.5ha potential terrestrial habitat and risk of killing/injuring - Local Reptiles: minor permanent loss of potential habitat potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site (Japanese knotweed: potential to spread invasive species TPO[228] trees: potential damage to trees under TPO 110-A1)
	Option 2 : Through-about to A3024 Bursledon	None	Semi-natural broadleaved woodland: Moderate permanent loss and fragmentation of woodland (c.0.4 ha) – Local Intact species poor hedgerow: Minor permanent loss of hedgerow (up to c.500 m) - Site	Badger: possible damage to setts, harm to animals and permanent loss of foraging habitat – Site Dormouse: loss of potential low quality connecting habitat and harm to individuals – Local Bats: Loss of trees which may have low potential to support roosting bat (Local), and loss of foraging/commuting habitat (Site) Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Great crested newt: minor permanent loss of c.0.5ha potential terrestrial habitat and risk of killing/injuring -

[228] Tree Preservation Order

Sub-schemes	Options	Designated Sites	Habitats	Protected and notable species (plus Japanese knotweed and TPO trees)
				Local Reptiles: minor permanent loss of potential habitat potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site (Japanese knotweed: potential to spread invasive species TPO trees: potential damage to trees under TPO 110-A1)
	Option 3 : Free-flow left-turn slip lanes at M27 Junction 8	Oakleigh Meadow SINC: Possible minor temporary damage of edge of SINC[229] during widening of adjacent slip road - Local	Semi-natural broadleaved woodland: Minor permanent loss of edge of woodland (<0.1ha) – Site Intact species poor hedgerow: Minor permanent loss of hedgerow (up to c.500 m) - Site	Badger: possible damage to setts, harm to animals and permanent loss of foraging habitat – Site Dormouse: loss of potential low quality connecting habitat and harm to individuals – Local Bats: Loss of trees which may have low potential to support roosting bat (Local), and loss of foraging/commuting habitat (Site) Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Great crested newt: moderate permanent loss of c.1ha potential terrestrial habitat and risk of killing/injuring individuals and fragmenting habitats - Local Reptiles: moderate permanent loss of potential habitat and potential for killing/injuring – Local Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site (Japanese knotweed: potential to spread invasive species TPO[230] trees: potential damage to trees under TPO 110-A1)
	Option 4 : Through-about to A3025 Hamble Lane	None	Semi-natural broadleaved woodland: Moderate permanent loss and fragmentation	Badger: possible damage to setts, harm to animals and permanent loss of foraging habitat – Site Dormouse: loss of potential low quality connecting habitat and harm to

[229] Sites of Importance for Nature Conservation
[230] Tree Preservation Order

Sub-schemes	Options	Designated Sites	Habitats	Protected and notable species (plus Japanese knotweed and TPO trees)
			of woodland (c.0.4 ha) – Local Intact species poor hedgerow: Minor permanent loss of hedgerow (up to c.500 m) - Site	individuals – Local Bats: Loss of trees which may have low potential to support roosting bat (Local), and loss of foraging/commuting habitat (Site) Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Great crested newt: minor permanent loss of c.0.5ha potential terrestrial habitat and risk of killing/injuring - Local Reptiles: minor permanent loss of potential habitat and potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site (Japanese knotweed: potential to spread invasive species TPO trees: potential damage to trees under TPO 110-A1)
	Option 5 : Tunnel under Windhover Round-about	None	Semi-natural broadleaved woodland: Moderate permanent loss and fragmentation of woodland (c.0.4 ha) – Local Intact species poor hedgerow: Minor permanent loss of hedgerow (up to c.500 m) - Site	Invertebrates: minor permanent loss of habitat with potential to support SPIs[231]/diverse assemblages - Negligible Badger: possible damage to setts, harm to animals and permanent loss of foraging habitat – Site Dormouse: loss of potential low quality connecting habitat and harm to individuals – Local Bats: Loss of trees which may have low potential to support roosting bat (Local), and loss of foraging/commuting habitat (Site) Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Great crested newt: minor permanent loss of c.0.5ha potential terrestrial habitat and risk of killing/injuring - Local Reptiles: minor permanent loss of potential habitat and potential for

[231] Species of Principal Importance

Sub-schemes	Options	Designated Sites	Habitats	Protected and notable species (plus Japanese knotweed and TPO trees)
				killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1: Signal control improvements	None	None	None
	Level 2: Junction and signal improvements	None	None	None
	Level 3: Dualling full A3024 corridor	Sholing Common SINC: minor permanent loss of upto 0.07 ha of 2 ha site (3.5 %) including bank of improved grassland, and corner of poor semi-improved grassland - Local Windhover (Netley Common South) SINC: minor permanent loss of up to 0.1 ha of 10.7 ha site (0.9 %), including woodland, and c.50 m^2 heathland (for which the site was designated) - Local Shoreburs Greenway SINC[232] - minor potential temporary damage to edge of woodland in southern part of SINC; allotments in northern part of SINC unlikely to be affected - Local	Semi-natural broadleaved woodland: Moderate permanent loss of woodland edges (c.0.4 ha) – Local Intact species poor hedgerow: Minor permanent loss of hedgerow (up to c.600 m) - Site	Badger: possible damage to setts, harm to animals and permanent loss of foraging habitat – Site Dormouse: loss of potential low quality woodland edge habitat and harm to individuals – Local Bats: Loss of trees which may have low potential to support roosting bat (Local), and loss of foraging/commuting habitat (Site) Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Great crested newt: minor permanent loss of c.0.1ha potential terrestrial habitat c.200m from pond and risk of killing/injuring – Site to Negligible Reptiles: minor permanent loss of potential habitat and potential for killing/injuring – Local Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site (TPO[233] trees: potential damage to and loss of trees under TPOs T2-370, T2-125 and T2-578)

[232] Sites of Importance for Nature Conservation
[233] Tree Preservation Order

Sub-schemes	Options	Designated Sites	Habitats	Protected and notable species (plus Japanese knotweed and TPO trees)
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1: New bridge / Refurbish existing	None	None	Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Reptiles: minor permanent loss of potential habitat and potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site
	Option 2: New bridge / Raise and refurbish existing	None	None	Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Reptiles: minor permanent loss of potential habitat and potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site
	Option 3A: New bridge / Demolish and replace existing - close subway	None	None	Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Reptiles: minor permanent loss of potential habitat and potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site
	Option 3B: New bridge / Demolish and replace existing - retain subway	None	None	Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Reptiles: minor permanent loss of potential habitat and potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site
Sub-scheme 5: Bittern Bridge Widening	Option 1: Tidal flow gantry system	None	None	None
	Option 2: Widening of existing bridge	None	None	Bats: Loss of trees which may have low potential to support roosting bat - Local Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Reptiles: minor permanent loss of potential habitat and potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring –

Sub-schemes	Options	Designated Sites	Habitats	Protected and notable species (plus Japanese knotweed and TPO trees)
				Site (Japanese knotweed: potential to spread invasive species)
	Option 3: Replacement (widening) of existing deck	None	Semi-natural broadleaved woodland: minor permanent loss of woodland (c.0.05ha) – Site	Bats: Loss of trees which may have low potential to support roosting bat - Local Breeding birds: minor permanent loss of habitat and potential to kill/injure birds – Site Reptiles: minor permanent loss of potential habitat and potential for killing/injuring – Site Hedgehog: minor permanent loss of habitat and potential killing/injuring – Site (TPO[234] trees: loss of trees under TPO T2-351 Japanese knotweed: potential to spread invasive species)

RESIDUAL EFFECT

8.7.7 Implementation of the recommended mitigation and compensation measures, as described in **Section 8.6.5**, should result in a negligible residual effect on all IEFs[235] in the long-term. In the short-term, loss of habitat as a result of construction may result in a significant short-term residual effect at the local to site levels for IEFs under the following sub-scheme options (geographical level of residual effect given in brackets):

- Sub-scheme 1
  - Option 1: Semi-natural broad-leaved woodland (Site); Species poor hedgerow (Site)
  - Option 2: Semi-natural broad-leaved woodland (Local); Species poor hedgerow (Site)
  - Option 3: Oakleigh Meadow SINC[236] (Local); Semi-natural broad-leaved woodland (Site); Species poor hedgerow (Site)
  - Option 4: Semi-natural broad-leaved woodland (Local); Species poor hedgerow (Site)
  - Option 5: Semi-natural broad-leaved woodland (Local); Species poor hedgerow (Site)
- Sub-scheme 2
  - Level 1: no significant residual effects
  - Level 2: no significant residual effects

[234] Tree Preservation Order
[235] Important Ecological Features
[236] Sites of Importance for Nature Conservation

- Level 3: Sholing Common SINC (Local); Windhover (Netley Common South) SINC (Local); Shoreburs Greenway SINC (Local); Semi-natural broad-leaved woodland (Local); Species poor hedgerow (Site)

→ Sub-scheme 3

- Option 1: no significant residual effects
- Option 2: no significant residual effects
- Option 3: no significant residual effects

→ Sub-scheme 5

- Option 1: no significant residual effects
- Option 2: no significant residual effects
- Option 3: Semi-natural broad-leaved woodland (Site)

8.7.8 However, the above short-term effects would become negligible once the compensatory habitat creation or enhancement reached maturation.

8.7.9 Trees subject to TPOs[237] would be lost under Sub-scheme 5 Option 3 (under TPO T2-351) and Sub-scheme 2 Level 3 (under TPOs T2-370, T2-125 and T2-578).

ASSESSMENT OF DO MINIMUM/DO SOMETHING SCENARIOS

8.7.10 This section characterises the potential ecological impacts that are likely to arise in the absence of mitigation during construction and operation of four scenarios:

→ Do Minimum: without scheme (assume Smart Motorways implemented)

→ Do Something 1 - Dualling of A3024 Corridor

→ Do Something 2: Signalised Junction Improvements of A3024 Corridor

→ Do Something 3: Sub-scheme 1 (Option 1) only.

[237] Tree Preservation Order

DO MINIMUM

8.7.11 In the absence of the scheme, there would be no construction and no consequential loss of habitat and therefore no direct effects on IEFs[238]. Increases in traffic between 2016 and 2019 (the proxy scheme opening year in terms of traffic modelling data) would result in an associated increase in noise which would have potential to disturb birds for which the Solent and Southampton Water SPA[239] and adjacent Solent and Dorset Coast pSPA were designated, and a potential deterioration in air quality which could affect the Ramsar site habitats. However, as discussed for the worst case scenario below (**Section 8.7.15**), it is unlikely that the noise levels would significantly affect the birds as they are already habituated to a high level of traffic. In addition, the specific features (bird species) which form the primary reason for site designation were recorded at least 500 m from the A3024[240]. At this distance, the noise from the road would be negligible in comparison to closer sources of noise such as riverside industrial developments. Similarly, air quality would be unlikely to affect the habitats in the vicinity of the A3024 as they are not sensitive to air quality (see **Section 8.7.15**).

8.7.12 It is unlikely that the predicted increase in traffic between 2016 and 2019 in the absence of the scheme (an extra c.2700 24hr AADT[241], i.e. 8 % increase) would have a significant effect on other protected/notable species populations. This is because they are already subject to impacts associated with roads such as fragmentation of habitat, disturbance from traffic noise and lights, and mortality from collision with vehicles.

8.7.13 Overall, impacts from the Do Minimum scenario would be negligible on IEFs and no further ecological surveys would be required.

DO SOMETHING 1 - DUALLING OF A3024 CORRIDOR

8.7.14 The traffic modelling proxy for the Do Something 1 scenario, as described in **Section 3**, predicts that in 2019 (similar to 2036 predictions) the scheme would result in an increase of approximately 3,350 vehicles on the A3024 where it crosses the River Itchen i.e. a total increase, summing both directions, of c.9 % over the Solent and Southampton Water SPA and Ramsar site and adjacent Solent and Dorset Coast pSPA. Potential operational impacts considered included air quality effects on the wetland habitats and noise affecting the waterfowl and wading birds for which the sites were designated, as a result of increase in traffic.

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[238] Important Ecological Features
[239] Special Protection Areas
[240] Frost, T.M., Austin, G.E., Calbrade, N.A., Holt, C.A., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. and Balmer, D.E. 2016. Waterbirds in the UK 2014/15: The Wetland Bird Survey. BTO/RSPB/JNCC. Thetford. http://www.bto.org/volunteer-surveys/webs/publications/webs-annual-report
[241] Annual Average Daily Traffic

8.7.15 The wetland habitats in the locality are mudflats, which are not sensitive to the predicted small changes in air quality[242], even when cumulative with the predicted increase in traffic in the absence of the scheme. Therefore, the significance of any such effects on the Ramsar habitat has been assessed to be negligible. Data from the Wetland Bird Survey (WeBS) annual report, presented on online maps on the BTO[243] website shows that none of the four important over-wintering species for the SPA[244] were recorded in the vicinity of the Northam River Bridge in 2014/15. The closest record for these species was dark-bellied brent goose, recorded c.500m to the south of the bridge. The location in which they were recorded is beyond a meander in the river to the south of the bridge, separated from it by Millbank Industrial area, and therefore would not be visible from the bridge. As a result, it is unlikely that the features for which the SPA was designated would be disturbed by an increase in traffic along the A3024.

8.7.16 Similarly, the existing noise level from the road link adjacent to the pSPA/SPA/Ramsar sites are 74.3 dB (using LA10,18 hr), and in the worst case scenario (Do Something 1) noise levels are only expected to increase to 74.6 dB, a change of 0.3 dB (0.4 % increase), as a result of the scheme in 2019, with the same increase predicted as a result of the scheme in 2036. Therefore, as any birds in the area (such as oystercatcher, redshank and dunlin recorded on The Wetland Bird Survey (WeBS)[245]) would already be habituated to the loud noise of the existing road, it is unlikely they would be significantly disturbed by the small 0.4 % predicted increase in noise levels, even when cumulative with the predicted increase in traffic in the absence of the scheme (see AIES[246] for further assessment).

8.7.17 The Solent Maritime SAC[247] and River Itchen SAC are also unlikely to be significantly affected by the scheme due to their distance from construction areas, and as no significant changes are predicted in nearby traffic flows or air quality on the M27 as a result of the scheme (as assessed in separate AIESs).

8.7.18 No operational impacts resulting from this combination of scheme options are identified for other protected and notable species because the M27 and A3024 are already heavily used roads, as discussed in **Section 8.7.6**. Therefore, protected species in the vicinity are already subject to impacts associated with roads and it is unlikely that the road improvements and the consequential, proportionally small, increase in traffic (expected to be a maximum of 9 % on the A3024 as a result of the Do Something 1 Option) would have a significant effect on protected/notable species populations.

8.7.19 Therefore operational impacts on IEFs[248] are expected to be negligible as a result of the scheme.

8.7.20 Construction, in the absence of mitigation, would result in potential significant effects at a local level for: Sholing Common SINC, Windhover (Netley Common South) SINC, Shoreburs Greenway SINC, semi-natural woodland, reptiles, dormouse, roosting bats and great crested newt. It would result in a significant effect at the site level only for: hedgerows, badger, foraging bats, breeding birds and hedgehog. Specialist surveys would be required to confirm impacts on protected species and inform mitigation measures.

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[242] Guide to habitats used in APIS. http://www.apis.ac.uk/habitat_table.html; accessed 20th September 2016
[243] British Trust for Ornithology
[244] Special Protection Areas
[245] British Trust for Ornithology Wetland Bird Survey: [online] available at https://www.bto.org/volunteer-surveys/webs
[246] Assessments of Implications on European Sites
[247] Special Areas for Conservation
[248] Important Ecological Features

8.7.21 With implementation of the recommended mitigation measures, the residual effect would be negligible for reptiles, dormouse, bats, great crested newt, badger, breeding birds and hedgehog. The residual effect would be significant in the short-term at the local level for Sholing Common SINC, Windhover (Netley Common South) SINC, Shoreburs Greenway SINC and woodland, and at the site level for hedgerows, until created/enhanced compensatory habitat had reached maturity. However, in the long-term the residual effect would be negligible for all IEFs[249].

DO SOMETHING 2 OPTION

8.7.22 For the Do Something 2 scenario, as described in **Section 3**, the scheme is predicted to result in a c.5 % increase in AADT[250] in 2019 on the A3024 where it crosses the River Itchen, therefore operational impacts are likely to be negligible, as described for Do Something 1 (**Sections 8.7.14 to 8.7.19**).

8.7.23 Construction impacts, in the absence of mitigation, would result in a potential significant effect at local level for: great crested newt, dormouse and roosting bat; and at a site level only for: semi-natural woodland, hedgerow, reptiles, breeding birds, badger, foraging bats and hedgehog. These effects would occur as a result of Sub-scheme 1 and 3, whereas Sub-schemes 2 and 5 would not result in any significant effects under this scenario. Specialist surveys would be required to confirm impacts on protected species and inform mitigation measures.

8.7.24 With implementation of the recommended mitigation measures, the residual effect would be negligible for reptiles, dormouse, bats, great crested newt, badger, breeding birds and hedgehog. The residual effect would be significant in the short-term at the site level for semi-natural woodland and hedgerows, until created/enhanced compensatory habitat had reached maturity. However, in the long-term the residual effect would be negligible for all IEFs.

DO SOMETHING 3: SUB-SCHEME 1 ONLY

8.7.25 For the Do Something 3 scenario, as described in **Section 3**, a 0.4 % increase in AADT is predicted as a result of the scheme on the A3024 over the River Itchen, therefore operational impacts would be negligible.

8.7.26 It would result, in the absence of mitigation, in a potential significant effect at local level for: great crested newt, dormouse and roosting bat; and at a site level only for: semi-natural woodland, hedgerow, reptiles, breeding birds, badger, foraging bats and hedgehog. Specialist surveys would be required to confirm impacts on protected species and inform mitigation measures.

8.7.27 With implementation of the recommended mitigation measures, the residual effect would be negligible for reptiles, dormouse, bats, great crested newt, badger, breeding birds and hedgehog. The residual effect would be significant in the short-term at the site level for semi-natural woodland and hedgerows, until created/enhanced compensatory habitat had reached maturity. However, in the long-term the residual effect would be negligible for all IEFs.

8.7.28 The Do Minimum scenario would result in the least ecological impacts as there would be no loss of habitat and therefore no effects on IEFs.

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[249] Important Ecological Features
[250] Annual Average Daily Traffic

8.7.29 Do Something 3 would be the scenario with the second lowest ecological effect due to the restriction of impacts to Sub-scheme 1 only. Do Something 2 would have a similar effect as Do Something 3, with the same receptors being affected at the same geographical level, but with slightly greater impacts as a result of loss of more habitat under Do Something 2 due to inclusion of Sub-scheme 3 and 5 proposals.

8.7.30 Do Something 1 would result in the most significant ecological effects, primarily due to short-term residual effects likely to result on (non-statutory) SINC[251] as a result of carriageway widening under Sub-scheme 2, Level 3. In addition, loss of habitat and therefore potential effects on protected and notable species (if present) would be significantly greater under this scenario.

SUMMARY

8.7.31 **Table 8-7** presents a summary of the short-term residual effects of the sub-scheme options to enable them to be compared. In the long-term (c.10-20 years following habitat creation), there would be no significant residual effects, once habitat compensation measures had fully matured.

8.7.32 The options within each sub-scheme are ranked in the table in terms of the geographical level of significance of the overall ecological effects, with red showing the options under each sub-scheme with the most significant effect, orange intermediate, and green the least significant effect. Where the residual effects of two options under a sub-scheme were similar, the geographical significance level of pre-mitigation effects (**Table 8-6**) was used to rank the options according to level of ecological effect.

8.7.33 Under Sub-scheme 1, Option 3 would result in the greatest ecological effect as it would affect Oakleigh Meadow SINC at a local level, as well as two HPIs252 at a site level. Option 1 would result in the least ecological effect as it would only affect two (woodland and hedgerow) HPIs at a site level. Options 2, 4 and 5 are ranked as causing intermediate effects as they would affect woodland HPI at a local level and hedgerow HPI at a site level.

8.7.34 Under Sub-scheme 2 only Level 3 would have significant effects on ecological features including non-statutory designated sites, and therefore this was ranked as causing the greatest effect. Levels 1 and 2 would not significantly affect any IEFs253 and therefore are ranked as having the least effect.

8.7.35 Under Sub-scheme 3 all of the options would have a similar effect on ecological features and therefore are ranked equally.

8.7.36 Under Sub-scheme 5, Option 3 would have the greatest adverse ecological effect as it would affect woodland HPI at a site level. Neither option 1 nor 2 resulted in significant residual effects, however in the absence of mitigation Option 2 would result in effects on IEFs whereas Option 1 would not result in any significant affects, therefore Option 1 was ranked as having the least effect on ecological features.

Table 8-7 Summary of Geographical Level of Adverse Residual Effects

Sub-schemes	Options	Construction Impacts	Operation Impacts
Sub-scheme 1:	Option 1 : Localised Junction	Semi-natural broadleaved	No significant effect

[251] Sites of Importance for Nature Conservation
[252] Habitats of Principal Importance
[253] Important Ecological Features

Sub-schemes	Options	Construction Impacts	Operation Impacts
M27 Junction 8 and Windhover Roundabout Upgrades	Widening	woodland: Site Intact species poor hedgerow: Site	
	Option 2 : Through-about to A3024 Bursledon	Semi-natural broadleaved woodland: Local Intact species poor hedgerow: Site	No significant effect
	Option 3 : Free-flow left-turn slip lanes at M27 Junction 8	Oakleigh Meadow SINC: Local Semi-natural broadleaved woodland: Site Intact species poor hedgerow: Site	No significant effect
	Option 4 : Through-about to A3025 Hamble Lane	Semi-natural broadleaved woodland: Local Intact species poor hedgerow: Site	No significant effect
	Option 5 : Tunnel under Windhover Roundabout	Semi-natural broadleaved woodland: Local Intact species poor hedgerow: Site	No significant effect
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1: Signal control improvements	No significant effect	No significant effect
	Level 2: Junction and signal improvements	No significant effect	No significant effect
	Level 3: Dualling full A3024 corridor	Sholing Common SINC : Local Windhover (Netley Common South) SINC: Local Shoreburs Greenway SINC: Local Semi-natural broad-leaved woodland: Local Intact species poor hedgerow: Site (TPO[254] trees: loss)	No significant effect
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1: New bridge / Refurbish existing	No significant effect	No significant effect
	Option 2: New bridge / Raise and refurbish existing	No significant effect	No significant effect
	Option 3A: New bridge / Demolish and replace existing - close subway	No significant effect	No significant effect

[254] Tree Preservation Order

Sub-schemes	Options	Construction Impacts	Operation Impacts
	Option 3B: New bridge / Demolish and replace existing - retain subway	No significant effect	No significant effect
Sub-scheme 5: Bittern Bridge Widening	Option 1: Tidal flow gantry system	No significant effect	No significant effect
	Option 2: Widening of existing bridge	No significant effect	No significant effect
	Option 3: Replacement (widening) of existing deck	Semi-natural broad-leaved woodland: Site (TPO[255] trees: loss)	No significant effect

Note: colours show ranking of the options under each sub-scheme according to which would have the least, intermediate, and the greatest adverse ecological effects

8.8 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

8.8.1 As various options/scenarios are still under consideration for the scheme, no further specialist species surveys have been undertaken following the preliminary Phase 1 Habitat Survey. Therefore the assessment of effects and mitigation/compensation recommendations are based on assumptions regarding potential presence of protected species. Presence or likely absence of these species would need to be assessed through further survey before the effect and required mitigation measures can be confirmed. In addition, no information was available regarding location of construction compounds and routes for construction traffic, therefore the potential impacts of these aspects will need to be considered once available.

8.8.2 Access was not possible to parts of the scheme where there was no public right of way/pavement adjacent to the road. This prevented access to M27 Junction 8 roundabout, parts of the Windhover roundabout, the A3024 between the two roundabouts, and parts of the A3024 between Windhover roundabout and Botley Road to the west. Habitats were assessed based on visibility from the nearest footpath/pavement on Windhover roundabout and the road to the west, and using biological records and information from publically available sources, including aerial photography, and Google Street View for inaccessible areas to the east of Windhover roundabout and Junction 8.

[255] Tree Preservation Order

9 GEOLOGY AND SOILS

9.1 INTRODUCTION

9.1.1 This section provides a high level assessment of the relative impacts of the sub-scheme options (as detailed in **Section 3**) and the geological, geomorphological and soils attributes. It summarises baseline conditions, details potential effects on environmental attributes and also considers potentially contaminated land, which has the potential to constrain the sub-scheme options.

9.2 ASSESSMENT METHODOLOGY

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

- DMRB[256] Volume 11, Section 2, Part 5: Assessment and Management of Environmental Effects, (2008); and,
- DMRB Volume 11, Section 3, Part 11: Geology and Soils (1993).

9.2.2 This section comprises Stage 1 of the assessment methodology as set out in DMRB Volume 11, Section 3, Part 11. This approach has been used to identify attributes of importance (e.g. geology, geomorphology and soils), and the significance and magnitude of potential effects upon them, to be taken into account when refining the sub-scheme options.

9.2.3 A Phase 1 Preliminary Risk Assessment (PRA) has been undertaken to establish baseline conditions in the study area. The PRA also assesses potential interactions with geology, geomorphology and soils (including the potential for land contamination) during the construction and operational phases of the sub-scheme options.

9.2.4 The baseline conditions of the study area have been assessed with reference to the following sources of information:

- Groundsure® Reports:
  - GS-3280712, 07 Sep. 16;
  - GS-3280713, 07 Sep. 16;
  - GS-3280715, 07 Sep. 16; and,
  - GS-3280716, 07 Sep. 16.
- BGS 1:50,000 Series Geological Map Sheet No. 315 ‘Southampton’ (Solid and Drift ed.), 1987;
- British Geology Survey online[257];
- British Geological Survey web-hosted Onshore GeoIndex[258];

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[256] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[257] British Geology Survey ‘Geology of Britain” Viewer [online] available at (http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer/

- Environment Agency (EA), (2016). What's in your backyard? Groundwater Source Protection Zones Map[259];
- Natural England, (2010). Agricultural Land Classification map London and the South East (ALC007)[260]; and
- Defra 'Magic' Map[261].

LAND CONTAMINATION

9.2.5 The potential for land contamination within the study area has been assessed in accordance with the principles of the EA[262] report CLR11: Model Procedures for the Management of Land Contamination[263]. In accordance with current UK Government guidance, qualitative risks on land contamination are assessed using a 'Source-Pathway-Receptor' approach, where the following definitions apply:

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

9.2.6 Such an approach recognises that risks from site-based contaminants can only exist where all three components are present, constituting a complete contaminant linkage.

9.2.7 The level of risk is evaluated in accordance with CIRIA C552[264]. This involves qualitative classification of the consequence and probability of each potential contaminant linkage. The classifications are compared to determine the corresponding risk category.

9.2.8 The framework for determining the classification of consequence, presented in full in CIRIA C552, is summarised in **Table 9-1.** The classification does not account for the probability of the consequence being realised.

Table 9-1 Qualitative Risk Assessment – Classification of Consequence

Classification	Definition
Severe	Short term (acute) risks to human health, likely to result in significant harm. Short-term risk of polluting sensitive water resources. Short-term risk to a particular ecosystem or organism forming part of such ecosystem.
Medium	Chronic damage to human health (significant harm). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem.

[258] British Geological Survey web-hosted Onshore GeoIndex [online] available at: http://www.bgs.co.uk/geoindex/
[259] Environment Agency (2016): What's in your backyard? Groundwater Source Protection Zones Map http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e
[260] Natural England (2010) ALC London and the South East (ALC007) map: [online] available at http://publications.naturalengland.org.uk/category/5954148537204736
[261] Department for Environment, Food and Rural Affairs (Defra); Magic Map [online] available at: http://magic.defra.gov.uk/MagicMap.aspx
[262] Environment Agency
[263] CLR11: Model Procedures for the Management of Land Contamination [online] available at]http://www.claire.co.uk/index.php?option=com_content&view=article&id=187&catid=45&Itemid=256
[264] CIRIA C552; (2001): Contaminated Land Risk Assessment – A Guide to Good Practice.

Classification	Definition
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or to the environment.
Minor	Harm, not necessarily significant, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health. Easily repairable effects of damage to buildings, structures and services.

9.2.9 The framework for determining the classification of probability, presented in full in CIRIA C552[265], is summarised in **Table 9-2.**

Table 9-2 Qualitative Risk Assessment – Classification of Probability

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

9.2.10 Once the consequence and probability have been determined for a potential contaminant linkage, these have been compared using the matrix shown in **Table 9-3** to produce a risk category ranging from 'very high risk' to 'very low risk'.

Table 9-3 Qualitative Risk Assessment – Risk Category

		Consequence			
Probability		**Severe**	**Medium**	**Mild**	**Minor**
	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate/ Low Risk
	Likely	High Risk	Moderate Risk	Moderate/ Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/ Low Risk	Low Risk	Very Low Risk	Very Low Risk

[265] CIRIA C552; (2001): Contaminated Land Risk Assessment – A Guide to Good Practice.

VALUE (SENSITIVITY)

9.2.11 A value (or 'sensitivity') has been assigned to each attribute in accordance with the principles established in Volume 11, Section 2, Part 5 of the DMRB[266].

9.2.12 Following consideration of the potential for post-constructional effects, such as the remobilisation of contaminative substances following ground disturbance during the construction process, a value has also been assigned to the potential contaminated land receptors identified in the conceptual site model (CSM).

9.2.13 Assigning sensitivity relies on reason, professional judgement, and the advice of appropriate organisations (Volume 11, Section 2, Part 5 of the DMRB).

9.2.14 The values (and typical descriptors) assigned to attributes and contaminated land receptors are defined in **Table 9-4.**

[266] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

Table 9-4 Defining the Value (Sensitivity) of Attributes and Contaminated Land Receptors

Value (Sensitivity)	Attributes		Contaminated Land Receptors			
	Geology & Geomorphology	Soils	Controlled Waters	Built Environment	Construction Workers	End Users
High	Nationally important geological or geomorphological features (SSSI[267]) or mineral resources.	Good to excellent quality agricultural land.	Principal aquifer beneath site, and/or major surface water in close proximity.	Buildings of high historical value or other high sensitivity.	Extensive earthworks including demolition of buildings.	Residential development, allotments, plays areas.
Medium	Regionally Important Geological Sites (RIGS) or mineral resources.	Poor to moderate quality agricultural land.	Secondary aquifer beneath site and/or minor surface water in close proximity.	Buildings, including services and foundation.	Limited to moderate earthworks.	Landscaping or public open space.
Low	No geological or mineral features of importance in close proximity.	Very poor quality agricultural land. Made ground with little potential for farming use.	Aquitard or aquiclude beneath site. No surface water body in close proximity.	Not applicable.	Minimal disturbance of ground.	'Hard' end use (e.g. industrial use, road, car park).

[267] Sites of Special Scientific Interest

MAGNITUDE OF IMPACT (DEGREE OF CHANGE)

9.2.15 The magnitude of impact is assigned using reason and professional judgement (typical descriptors, set out in Volume 11, Section 2, Part 5, of the DMRB[268], are provided in **Section 4**).

SIGNIFICANCE OF EFFECT

9.2.16 The significance of effects is determined using the matrix in DMRB Volume 11, Section 2 Part 5, detailed in **Table 4-2**.

9.3 STUDY AREA

9.3.1 A study area for the assessment of effects on geology and soils is not specified in the DMRB. The study area specified in the Research and Development Publication 66[269] states that off-site features within an area up to 250 m from the site boundary should typically be considered within the hazard identification stage of site assessment.

9.3.2 For the purposes of this section, the study area is defined as the land within 250 m of the maximum extent of the sub-scheme options.

9.4 BASELINE CONDITIONS

GROUND CONDITIONS

MADE GROUND

9.4.1 The land within the study area is predominantly urban in use. Due to the majority of this land having a residential, commercial or infrastructural land use, it is expected that a veneer (≤ 5 m) of Made Ground is present throughout the study area. The British Geological Survey (BGS) maps a swathe of Made Ground in coastal regions of Southampton. The coastal location and angular morphology of water frontages suggest these are likely to be reclaimed estuarine land. Parts of this reclaimed land fall within the 250 m study area surrounding Sub-schemes 2, 3 and 5. There are also sections of made ground at key road junctions including M27 Junction 8 (Sub-scheme 1), which are likely to have been excavated and built up to attain stability and aid road developments.

SUPERFICIAL GEOLOGY

9.4.2 The predominant drift geologies in the area are tidal flat deposits consisting of clay and silt underlying Sub-scheme 3 and coastal parts of Sub-scheme 2. The alluvium and tidal flat deposits associated with the River Itchen have moderate compressibility and a low to moderate risk of running sands. Running sands are considered as a permeable and rapid pathway for contamination transferal.

9.4.3 There are several generations of river terrace deposits consisting of gravels and sands underlying Sub-scheme 5, Sub-scheme 1 and areas of Sub-scheme 2. River Terrace Deposits within the study area are related to the progression of the main river, the River Itchen, and its tributaries.

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[268] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

[269] Research and Development Publication 66: Guidance for the Safe Development of Housing on Land Affected by Contamination (EA/NHBC, 2008)

SOLID GEOLOGY

9.4.4 Open folding (less than 160^{o} in angle) results in variation of the bedrock geology throughout the study area.

9.4.5 Sub-scheme 3 and parts of Sub-schemes 1 and 2 overlie the Wittering Formation which is Eocene in age and composed of laminated clay with some sandy interbeds.

9.4.6 Sub-scheme 5 and parts of Sub-schemes 1 and 2 overlie London Clay which is also Eocene in age and composed of laminated silty and sandy clay with calcareous and pyritic beds. A characteristic of the London Clay which should be noted is its' moderate shrink-swell capacity. A notable member of this formation encountered within the study area is the Portsmouth Sand Member which is of high permeability along with other pebble beds and sand-rich members.

9.4.7 The London Clay Formation is mapped to reach thicknesses between 53 m to 114 m. It is therefore unlikely that the underlying Reading Formation would be encountered during surficial and even tunnelling excavations (proposed for Sub-Scheme 1, Option 5).

9.4.8 Published stratigraphy describes the clay of Wittering Formation to be firm with compact sands. The clay of the London Clay Formation is also described as firm but with a higher frequency of gravel clasts (flint and other) and fissuring.

DESIGNATED SITES

9.4.9 The sites of highest nature conservation sensitivity near the scheme are the Itchen estuary, a designated SSSI[270], and a LNR[271]. Large sections along the Itchen estuary are also designated as Ramsar sites and SPAs, The potential impacts on these sites in ecological terms are assessed in **Section 8**. There are no identified RIGS[272] in the study area.

SOIL QUALITY

9.4.10 The study area is generally categorised as 'land predominantly in urban or non-agricultural use'. However, land around Sub-scheme 1 upgrades is classified as Grade 4 (poor) agricultural land by the Agricultural Land Classification (ALC) system. The study area does not contain any 'best and most versatile' (BMV) agricultural land.

9.4.11 Defra[273] identifies the whole of Southampton, and thus all of the Sub-schemes, as a eutrophic nitrate vulnerable zone (NVZ). However, its predominant function as urban land means the soils are considered to be of low value. Restrictions implemented on NVZs are unlikely to restrict road improvement works.

[270] Sites of Special Scientific Interest
[271] Local Nature Reserve
[272] Regionally Important Geological and Geomorphological Sites
[273] Department for Environment, Food and Rural Affairs

GROUNDWATER

9.4.12 Groundsure report GS-3280716 confirms the high to very high permeability of the superficial deposits (intergranular River Terrace Deposits) in parts of the Sub-schemes 1, 2 and 5, classified by the EA[274] as Secondary A Aquifers. These characteristics result in a high leaching potential and a rapid pathway for contamination transferal. The Wittering Formation is a Secondary A bedrock aquifer: the upper clay member of the London Clay is of very low permeability and acts as an aquiclude.

9.4.13 There are no groundwater Source Protection Zones (SPZs) or groundwater extraction points within the 250 m radial study area surrounding the maximum extent of the four sub-schemes.

SURFACE WATER

9.4.14 The most notable surface water feature within the study area is the River Itchen and its related tributaries, which the scheme will interact with. The River Itchen flows southwards to converge with the River Test and form Southampton Water. Agricultural drainage ditches linking to culverts and tertiary rivers are proximal to Sub-scheme 1.

9.4.15 There is one surface water abstraction licence (Licence No. 11/42/23/3), 250m east from Sub-scheme 3. It is associated with Cemex UK Material and is for mineral washing.

HISTORICAL LAND USE

9.4.16 The western section of the study area, including Sub-schemes 3, 5 and parts of Sub-scheme 2, traverses coastal sites historically used by heavy industries such as ship builders and foundries, also containing gasworks, railway land and rope walks.

9.4.17 The central and eastern sections, including Sub-scheme 1 and parts of Sub-scheme 3 were, historically, much less developed, though brick works, gravel, sand and clay pits were common. These areas saw a progressive increase in the development of residential properties, associated with the expansion of the city of Southampton.

9.4.18 Selected historical land uses of interest within the study area of all Sub-schemes are summarised in **Table 9-5.**

Table 9-5 Summary of Historical Land Use along the A3024 Corridor

Aspect	Map Dates	Comments
Open pit mine workings – gravels, sands and clays	1869 - 1942	There are numerous examples of mining of the superficial and bedrock geology adjacent and proximal to the road course over the specified times.
Rural / agricultural land use	Prior to 1869 - Present	The mid and eastern sections of the corridor travel through areas historically mapped as fields, farmland, parklands and woodland. These have gradually been in-filled with residential dwellings until only small pockets (such as Hum Hole) remain.
Residential land	Prior to 1869 - present	Terraced residential properties have been present in the western parts of the entire study area since prior to 1869, with their increase in-filling open allotments and parklands further east from 1895 onwards.
Commercial	1957 -	There has been development of several educational institutions within the

[274] Environment Agency

Aspect	Map Dates	Comments
land	Present	entire study area.
Industrial land	1869 - Present	Gasholders have existed to the south of Northam Road within the 250 m area of consideration surrounding Sub-scheme 3 since 1908. Timber yards, wharves, numerous types of mills works and depots have existed along the Itchen estuary in the study area of western sections since before the first available County Series map in 1869. These facilities were expanded through the 1800's and 1900's, with development of jetties for more leisure purposes from 1990 onwards. In 2002, brownfield land in the Bitterne and Northam areas near Sub-schemes 3 and 5 were developed into industrial parks. Some small mining pits were present in the 1800's, later either infilled to allow residential development or turned into parks.
London to Southampton Railway	1838 - Present	Records from the Hampshire cultural trust (http://hampshireculturaltrust.org.uk/content/railways-hampshire) detail the London to Southampton Railway line to be operational from 1838. The earliest available County Series map (1869) shows the railway in the same situation as the present day, but with the railway depot north of Sub-scheme 3 falling out of use soon after 1990.
M27	1976 - Present	The M27 (including Junction 8) and Windhover roundabout within Sub-scheme 1 did not exist until 1976 when they replaced farmland. They have not been noticeably developed since their instalment.

CURRENT LAND USE

9.4.19 The majority of transport links within the entire study area are located within residential or commercial urban land. Sub-scheme 1 is surrounded by agricultural land. The River Itchen and its subsidiary channels are present within the study area, flowing south towards Southampton Water. The Bitterne and Northam Rail Bridges in Sub-schemes 3 and 5 cross over the Southampton to Portsmouth coastal railway line.

9.4.20 There is a complex network of residential streets within the whole of the study area, connecting to the major roadways to be improved. Numerous commercial (shops, hotels, public houses etc.), residential and industrial properties (railway stations, scrap yards, manufacturing plants, garages etc.) are located within the immediate vicinity of the proposed traffic improvements.

9.4.21 Data from the EA shows two landfill sites containing household waste directly west of the Windhover Roundabout within Sub-scheme 1, which should be treated as of unknown compositions and potential sources of contamination.

9.4.22 There are three locations to the east of the Sub-scheme 3 which are active points of extraction for marine sands and gravels along with crushed rock.

POTENTIAL FOR LAND CONTAMINATION

9.4.23 Where land has been contaminated as a result of former industrial processes, this has the potential to be a constraint on the sub-scheme options. Consideration is also given to the potential for any post-construction impacts, due to the potential for remobilisation of contamination within ground disturbed by the construction processes.

SOURCES

9.4.24 The multitude of industrial processes (gasworks, railways, wharves, rope walks, engine sheds, brickfields, foundries, shipbuilding yards, cement works, iron works, saw mills, linseed mills, pottery workshops, timber yards and sewerage works) which historically operated in the docklands area provide innumerable potential contaminants of concern, as detailed in **Table 9-6.**

9.4.25 The Made Ground underlying the entire study area is assumed a potential source of contaminative substances in the absence of Phase 2 ground investigation data and characterisation.

9.4.26 The four fuel stations situated along the A3024 corridor (Sub-scheme 2 as illustrated on **Figure 9-1** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS - 0017) and in the land surrounding to the south of Sub-scheme 3 also represent potential source areas. There is a potential for polluting discharges to have occurred from vehicles using the road and rail network. Discharges are likely to be hydrocarbon based and include diesel fuels and lubricants, and such events have the potential to have impacted drainage routes.

9.4.27 Radcliffe Road Allotments to the north of Sub-scheme 3 were determined as Contaminated land (under Part 2A of the PEA[275] 1990) in 2002. The significant contaminant linkage was associated with elevated concentrations of lead in soil (location indicated on **Figure 9-1** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS - 0017).

[275] Preliminary Ecological Appraisal

Figure 9-1 Potential Contamination Sources

HE551514 - WSP - GEN - M27 - FI - GIS - 0017

RADON

9.4.28 The entire study area is situated within a Radon Affected Area, as defined by the Health Protection Agency, with 1-3% of properties above the Action Level (200 Bq/m^3). The control strategy recommended by the National Radiological Protection Board (NRPB) and accepted by the Government includes the following provisions:

- → Radon concentrations at or above the Action Level of 200 Bq/m^3 should be reduced to as low as reasonably practicable; and,
- → New homes built within localities delimited by the appropriate Government authorities should be constructed with precautions against radon.

9.4.29 The sub-schemes are unlikely to be impacted by radon, risks from which are typically associated with accumulation in enclosed spaces such as basements. Radon is therefore not considered further in this assessment.

INVASIVE SPECIES

9.4.30 Japanese knotweed (*Fallopia japonica*) is a non-native Invasive Plant listed under Schedule 9 of the Wildlife & Countryside Act 1981, as amended. This has been identified during Ecological Phase 1 Habitat surveys within the maximum extent of Sub-scheme 1 (**Figure 8-4** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0016 **Sheet 1**)) and Sub-scheme 5 (**Figure 8-4** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0016 **Sheet 16**)). Any soil or plant material contaminated with Japanese knotweed that the scheme discards, intends to discard or are required to discard is likely to be classified as controlled waste.

9.4.31 The Environmental Protection Act (EPA) (1990), contains a number of legal provisions concerning “controlled waste”. This legislation creates offences regarding the deposit, treating, keeping or disposing of controlled waste without a permit. A registered waste carrier and an authorised landfill site or suitable disposal site will need to be used to dispose of any material containing this species off site. If soil has been treated and is free from Japanese knotweed contamination and suitable for use, it can be reused on site.

CONCEPTUAL SITE MODEL

9.4.32 Contamination sources impact different receptors through different pathways as detailed below:

1. Ingestion and inhalation of, and dermal contact with, contaminated soil, dust or particulates, potentially impacting **Construction Workers** and **End Users**.
2. Lateral migration of aqueous and dissolved contaminants via groundwater flow or preferential pathways to **Surface Waters**.
3. Vertical migration of aqueous and dissolved contaminants through Made Ground or via preferential pathways to **Groundwater**.
4. Chemical attack and degradation of contaminants on **Buildings and Buried Concrete Structures**.

9.4.33 On the basis of the PRA[276], a preliminary CSM[277] has been developed. Due to the number of potential historical and current areas of concern identified within the study area, a high level CSM has been prepared, which focusses on the principal areas of concern.

9.4.34 The CSM is presented as **Table 9-6** below. **Figure 9-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0017) locates where these sources can be found in relation to the Sub-schemes.

Table 9-6 Conceptual Site Model

Source	Potential Contaminants	Receptor	Consequence	Probability	Risk
Made Ground (associated with existing highways) and fuel stations.	Fuel and oil discharges.	Construction workers and End Users	Minor	Unlikely	Very Low Risk
		Surface water	Medium	Unlikely	Low Risk
		Groundwater	Mild	Unlikely	Very Low Risk
		Buildings	Minor	Unlikely	Very Low Risk
Brick Works and Pottery Workshops	Transition metal compounds, hexavalent chromium, various inorganic compounds.	Construction workers and End Users	Minor	Unlikely	Very Low Risk
		Surface water	Medium	Unlikely	Low Risk
		Groundwater	Minor	Unlikely	Very Low Risk
		Buildings	Minor	Unlikely	Very Low Risk
Clay, Sand and gravel Pits	Likely infill of ground with unknown waste material (releasing CH_4, CO_2).	Construction workers and End Users	Minor	Likely	Low Risk
		Surface water	Medium	Unlikely	Low Risk
		Groundwater	Mild	Unlikely	Very Low Risk
		Buildings	Minor	Unlikely	Very Low Risk
Gas Works	Ammoniacal liquor (hydrocarbons, cyanides etc), 'spent' oxide from processing. Various organic and inorganic compounds (fuels, acids, alkalis, metals etc.).	Construction workers and End Users	Medium	Likely	Moderate Risk
		Surface water	Medium	Likely	Moderate Risk
		Groundwater	Mild	Likely	Moderate / Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Railway Lines	Hydrocarbons, solvents, creosote,	Construction workers and	Medium	Likely	Moderate Risk

[276] Phase 1 Preliminary Risk Assessment
[277] Conceptual Site Model

Source	Potential Contaminants	Receptor	Consequence	Probability	Risk
	metals, asbestos, ash, sulphates.	End Users			
		Surface water	Mild	Low Likelihood	Low Risk
		Groundwater	Mild	Low Likelihood	Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Shipbuilding Yards	Metals and metal compounds, organic compounds used in paint solvents, fuels and oils, pickling acids, Cyanides, Coal, PCB's, Asbestos, Radioactive materials.	Construction workers and End Users	Medium	Likely	Moderate Risk
		Surface water	Medium	Low Likelihood	Moderate Risk
		Groundwater	Mild	Low Likelihood	Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Sewerage Works	Various metals, metal compounds, inorganic ions, treatment chemicals (including strong acids and alkalis), hydrocarbon gas, asbestos.	Construction workers and End Users	Medium	Low Likelihood	Moderate Risk
		Surface water	Medium	Low Likelihood	Moderate Risk
		Groundwater	Medium	Low Likelihood	Moderate/ Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Foundries and Iron Works.	Various metals and inorganic compounds, acids and alkalis, oils and hydrocarbons related to the production of coke, asbestos and solvents.	Construction workers and End Users	Medium	Likely	Moderate Risk
		Surface water	Medium	Low Likelihood	Moderate Risk
		Groundwater	Medium	Low Likelihood	Moderate/ Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Cement Works	Various inorganic compounds, blast furnace slag, pulverised fuel ash, hydrocarbons, plasticisers, cement and flue gas dusts.	Construction workers and End Users	Medium	Low Likelihood	Low Risk
		Surface water	Medium	Low Likelihood	Moderate/ Low Risk
		Groundwater	Mild	Low Likelihood	Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Landfill containing household waste.	Leachate and landfill gas released by decomposition of waste.	Construction workers and End Users	Medium	Likely	Moderate Risk
		Surface water	Medium	Low Likelihood	Moderate/ Low Risk
		Groundwater	Mild	Low	Low Risk

Source	Potential Contaminants	Receptor	Consequence	Probability	Risk
				Likelihood	
		Buildings	Mild	Low Likelihood	Low Risk
Wharves and docklands.	Likely construction on top of natural organic material releasing gasses (CH_4, CO_2). Likely infill of ground with unknown waste material. Dredgings containing metals. Release of contaminants from cargo passing through.	Construction workers and End Users	Medium	Likely	Moderate Risk
		Surface water	Medium	Low Likelihood	Moderate/ Low Risk
		Groundwater	Mild	Low Likelihood	Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Metal scrap yards and automobile construction.	Various metals, organic and inorganic compounds, acids and alkalis, hydrocarbons and oils, solvents, asbestos.	Construction workers and End Users	Medium	Low Likelihood	Moderate/ Low Risk
		Surface water	Medium	Low Likelihood	Moderate/ Low Risk
		Groundwater	Mild	Low Likelihood	Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Timber yards and saw mills.	Resins and resin hardeners, dyes and surface coatings, organic solvents and pigments, preservative treatments.	Construction workers and End Users	Medium	Likely	Moderate Risk
		Surface water	Medium	Low Likelihood	Moderate/ Low Risk
		Groundwater	Mild	Low Likelihood	Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Farmland	Buried waste from animal, household and machinery sources.	Construction workers and End Users	Medium	Low Likelihood	Moderate/ Low Risk
		Surface water	Medium	Low Likelihood	Moderate/ Low Risk
		Groundwater	Mild	Low Likelihood	Low Risk
		Buildings	Mild	Low Likelihood	Low Risk
Japanese Knotweed	Invasive plant species with strong, aggressive growth.	Buildings	Mild	Likely	Moderate/Low Risk

ATTRIBUTE IMPORTANCE (SENSITIVITY)

9.4.35 The attribute importance (sensitivity) assigned to the identified environmental attributes and contaminated land receptors are shown in **Table 9-7**. The attribute importance levels are defined in **Table 9-4**.

Table 9-7 Attribute Importance

Attribute / Contaminated Land Receptor	Justification	Attribute Importance (Sensitivity)
Geology and Geomorphology	Sections of the Sub-schemes 2, 3 and 5 around the River Itchen estuary directly interact with designated SSSIs[278] of biological importance. However, the entire study area does not lie within an area where nationally important geological or geomorphological features have been recorded (geological SSSIs) and there are no RIGS[279] within the study area.	**Low**
Soil	The area in which the development options are situated is primarily of urban use, with parts of Grade 4 (poor quality) agricultural land near Sub-scheme 1.	**Low**
Groundwater	The superficial deposits, where present, are classified as Secondary 'A' Aquifers. The Wittering Formation bedrock, which underlies much of the study area, is also a Secondary 'A' Aquifer. There are no licensed groundwater abstractions in the study area.	**Medium**
Surface Water	There is a Primary River within the study area (The River Itchen). There is a surface water abstraction licence within the study area, associated with Cemex UK Material mineral washing (Licence No. 11/42/23/3).	**High**
Built Environment	The study area includes the existing M27, A3024, interaction with railway lines and a multitude of residential and commercial properties in the city of Southampton. Several Grade II listed structures lie within the study area - largely churches. The presence of Japanese Knotweed in the 250 m zone of consideration surrounding Sub-schemes 1 and 5 could cause damage to foundations of the bridge and road through its forceful growth.	**Medium to High**
Construction Workers	It is assumed that best practice will be adhered to throughout construction. Moderate to extensive earthworks, which may include demolition of buildings.	**Medium to High**
End Users	The proposed future land use (i.e. a highway) is considered unlikely to expose end users to soil or groundwater contamination.	**Low**

REGULATORY AND POLICY FRAMEWORK

9.4.36 Policy and regulations of relevance to this assessment are as follows:

- National Planning Policy Framework, Department for Communities and Local Government, March 2012[280];
- NN NPS[281]) (DfT, 2014);

[278] Sites of Special Scientific Interest
[279] Regionally Important Geological Sites
[280] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

- The Contaminated Land (England) (Amendment) Regulations (2012);
- Contaminated Land Statutory Guidance (2012)[282];
- Technical Guidance to the National Planning Policy Framework[283];
- DMRB[284] Volume 11, Section 2, Part 5 Assessment and Management of Environmental Effects, (2008);
- DMRB Volume 11, Section 3, Part 11 Geology and Soils, (1993);
- Guidance for the Safe Development of Housing on Land Affected by Contamination. R&D Publication 66. Environment Agency / National House-Building Council. Volume 1. 2008;
- Model Procedures for the Management of Land Contamination (CLR11) (2004)[285];
- Environmental Protection Act (1990), Part 2A, Section 78;
- Water Environment (Water Framework Directive (WFD)) (England and Wales) Regulations 2003 (SI 2003/3243);
- Water Resources Act 1991 (SI 57) (as amended by the Water Act (2003); and
- Highways Act (1980) Section 105A.

9.5 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

9.5.1 Ground investigation work is required to characterise the existing ground conditions in relation to the CSM[286] (to include consideration of soil, groundwater, ground gas and geotechnical parameters). The works should be completed in accordance with BS10175:2011, CLR11 and other relevant standards and guidance. The information obtained must be utilised in the design and construction phases.

9.5.2 A CEMP[287] is also required, which will outline the mitigation, control and monitoring measures to be put in place to minimise the impact of the development options on ground conditions, land quality and water resources during the construction process.

9.5.3 Construction work is to proceed in adherence to the following documents:

- Protection of Workers and the General Public during the Development of Contaminated Land, HSE, (1991). This document establishes the key principles to take into account when designing and implementing work on contaminated sites to ensure the proper protection of the health and safety of employees and others who may be affected by such work; and

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[281] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[282] Contaminated Land Statutory Guidance: Department for Environment, Food and Rural Affairs, (Defra) (2012); [online] available at: https://www.gov.uk/government/publications/contaminated-land-statutory-guidance
[283] Technical Guidance to the National Planning Policy Framework, Department for Communities and Local Government, (2012).
[284] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[285] CLR11: Model Procedures for the Management of Land Contamination; Department for Environment, Food and Rural Affairs (2004): [online] available at]http://www.claire.co.uk/index.php?option=com_content&view=article&id=187&catid=45&Itemid=256
[286] Conceptual Site Model
[287] Construction Environmental Management Plan

- A Guide to Safe Working on Contaminated Sites, R132, CIRIA, (1996). This document is similar to the HSE document but also includes checklists to help in the preparation of health and safety risk assessments and the development of safe working practises, etc.

9.5.4 Soils removed to carry out road improvement works could potentially be retained and re-used, either as part of the development options, landscape works or elsewhere. Soils must be demonstrated to be suitable for use, following an appropriate testing and assessment strategy. The level of damage and deterioration in soil quality during storage and transit will depend on the types of earthworks machinery used, methods of handling and storage conditions.

9.5.5 A management plan to eradicate the Japanese Knotweed identified south of Bitterne Rail Bridge by 'Phase 1 Habitat Survey' should be prepared and implemented. The weed should be treated and removed in accordance with current industry best practice.

9.5.6 Japanese Knotweed would be dealt with in the long term/wider context by each respective landowner as part of their current obligations; (that responsibility would fall to Area 3 Asset Support Contract (ASC) Contractor for Highways England's Strategic Road Network (SRN) or the relevant Highway Authority if not Highways England).

9.6 OVERALL ASSESSMENT

9.6.1 The objective of this high level assessment is to assess and compare the magnitude of the potential impacts of the scheme on geology, geomorphology and soils, and to consider interactions between the sub-scheme options and identified contaminated land source areas, thereby informing the identification of options.

9.6.2 The sub-scheme options are expected to have similar impacts on geology, geomorphology and soil.

SUB-SCHEME 1: M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

Option 1: Localised Junction Widening

9.6.3 This option would involve a small amount of topsoil stripping with no substantial land take.

9.6.4 This option is expected to have a Neutral or Slight Adverse effect on soil, groundwater and surface waters during the construction phase and a Neutral effect on geology and geomorphology, the built environment, construction workers and end users.

Option 2: Through-about to A3024 Bursledon

9.6.5 This option involves the construction of new roads through the wooded centre of the roundabout and would significantly alter the land use and entail notable stripping of topsoil.

9.6.6 This option is expected to have a Neutral or Slight Adverse effect on soil, groundwater and surface waters during the construction phase and a Neutral effect on geology and geomorphology, the built environment, construction workers and end users.

Option 3: Free-flow Left-turn Slip Lanes at M27Junction 8

9.6.7 This option would involve a small amount of topsoil stripping with no significant land take.

9.6.8 This option is expected to have a Neutral or Slight Adverse effect on soil, groundwater and surface waters during the construction phase and a Neutral effect on geology and geomorphology, the built environment, construction workers and end users.

Option 4: Through-about to A3025 Hamble Lane

9.6.9 This option involves the construction of new roads through the wooded centre of the roundabout and would significantly alter the land use and entail notable stripping of topsoil.

9.6.10 This option is expected to have a Neutral or Slight Adverse effect on soil, groundwater and surface waters during the construction phase and a Neutral effect on geology and geomorphology, the built environment, construction workers and end users.

Option 5: Tunnel under Windhover Roundabout

9.6.11 This option involves subterranean tunnelling to create an underground direct roadway. This would involve significant stripping of topsoil along with excavation of bedrock.

9.6.12 This option is expected to have a Neutral or Slight Adverse effect on soil, groundwater and surface waters and Neutral effects on geology, geomorphology, the build environment, construction workers and end users.

SUB-SCHEME 2: A3024 EASTERN ACCESS CORRIDOR

Three options for increasing capacity and reducing journey times along the A3024 corridor have been identified. Northam Rail Bridge (Sub Scheme 3) and Bitterne Rail Bridge (Sub-scheme 5) sections are considered separately under different Sub Schemes.

Level 1: Signal Control Improvements

9.6.13 Level 1 improvements comprise UTC[288] and traffic signal controller reconfiguration at signalised junctions to enable GO[289] to eliminate running side roads for longer green times than required. Existing kerb lines and traffic signal infrastructure to be retained. No change to kerblines.

9.6.14 This option involves no ground works requiring take of residential property or community allotment land. Effects are anticipated to be Neutral to all attributes.

Level 2: Junction and Signal Improvements

9.6.15 Level 2 improvements comprise introduction of UTMC[290] MOVA[291] signal control at signalised junctions with ability to switch to UTC[292] control if conditions require. Minor changes to kerblines at junctions (introducing flares and turning pockets) to improve localised stop-line capacity.

9.6.16 This option involves minimal construction work. Land take is negligible and within Highways England land. Effects are anticipated to be Neutral to all attributes.

Level 3: Dualling Full A3024 Corridor

9.6.17 Level 3 improvements comprise the introduction of new overhead signal control measures at signalised junctions, carriageway widening where necessary to provide a two lane dual

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[288] Urban Traffic Control
[289] Gap Out
[290] Urban Traffic Management Control
[291] Microprocessor Optimised Vehicle Actuation
[292] Urban Traffic Control

carriageway along the entire A3024 corridor and new NMU[293] facilities (3m wide shared cyclepath/footway). Most of the carriageway widening would be undertaken between the Bitterne Road Bridge / A334 junction in the west and Windhover roundabout at the eastern end of the sub scheme; with the exception of the two rail bridges the A3024 is two lane dual carriageway west of Bitterne Road Bridge.

9.6.18 This option involves slight construction work requiring take of residential property and community allotment land. Effects are anticipated to be Neutral or Slight Adverse to soils and Neutral to all remaining attributes.

SUB-SCHEME 3: NORTHAM RAIL BRIDGE REPLACEMENT

Option 1: New Bridge / Refurbish Existing Bridge

9.6.19 This option involves demolition and construction. It would have Neutral or Slight Adverse effects on groundwater and surface waters during the construction phase, and Neutral effects to all remaining attributes.

Option 2: New Bridge / Raise and Refurbish Existing Bridge

9.6.20 This option involves demolition and construction. It would have Neutral or Slight Adverse effects on groundwater and surface waters during the construction phase, and Neutral effects to all remaining attributes.

Option 3A: New Bridge / Demolish and Replace Existing - Close Subway

9.6.21 This option involves demolition and construction. This would have Neutral or Slight Adverse effects on groundwater and surface waters during the construction phase, and Neutral effects to all remaining attributes.

Option 3B: New Bridge / Demolish and Replace Existing - Retain Subway

9.6.22 This option involves demolition and construction. This would have Neutral or Slight Adverse effects on groundwater and surface waters during the construction phase, and Neutral effects to all remaining attributes

9.6.23 For all options suggested for Sub-scheme 3, there are no anticipated adverse impacts to geology or soils, due to the ‘low quality’ of these attributes at this location. It is recommended that a piling risk assessment is undertaken, in order to assess the potential for the creation of preferential migratory pathways between contamination sources in the Made Ground and the underlying groundwater resource.

SUB-SCHEME 5: BITTERN BRIDGE WIDENING

Option 1: Tidal Flow Gantry System

9.6.24 This option involves installing traffic signalisation and does not involve any construction or land take. This option would have a Neutral effect on all attributes.

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[293] Non-Motorised User

Option 2: Widening of Existing Bridge

9.6.25 Amendment and widening of existing structure. There are likely to be Neutral or Slight Adverse effects on groundwater and surface waters during the construction phase, and Neutral effects to all remaining attributes.

Option 3: Replacement (Widening) of Existing Deck

9.6.26 Amendment and widening of existing structure. There are likely to be Neutral or Slight Adverse effects on groundwater and surface waters during the construction phase, and Neutral effects to all remaining attributes.

SUMMARY

9.6.27 **Table 9-8** below summarises the construction and operational phase impacts of the Sub-scheme options.

Table 9-8 Summary of Impacts

Sub-schemes	Options	Construction Impacts	Operation Impacts
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades	Option 1 : Localised Junction Widening	Negligible adverse effect on soils.	Eradication of Japanese knotweed means negligible beneficial effect on the built environment during operation.
	Option 2 : Through-about to A3024 Bursledon	Removal of top soil means a minor adverse effect on soils.	Eradication of Japanese knotweed means negligible beneficial effect on the built environment during operation.
	Option 3 : Free-flow left-turn slip lanes at M27 Junction 8	Negligible Adverse effect on soils.	Eradication of Japanese knotweed means negligible beneficial effect on the built environment during operation.
	Option 4 : Through-about to A3025 Hamble Lane	Removal of top soil means a minor adverse effect on soils.	Eradication of Japanese knotweed means negligible beneficial effect on the built environment during operation.
	Option 5 : Tunnel under Windhover Roundabout	Negligible adverse impact on soil, geology and geomorphology. Minor adverse effect on groundwater.	Eradication of Japanese knotweed means negligible beneficial effect on the built environment during operation. Minor adverse impact on groundwater.
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1: Signal control improvements	No Change.	No Change.
	Level 2: Junction and signal improvements	No Change.	No Change.
	Level 3: Dualling full A3024 corridor	Loss of land used for residential and community allotment purposes. Negligible adverse effect of soils. Negligible adverse impact on surface water.	No Change.

Sub-schemes	Options	Construction Impacts	Operation Impacts
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1: New bridge / Refurbish existing	Neutral or Slight Adverse impact on surface and groundwater. Neutral effect on all remaining attributes.	No Change.
	Option 2: New bridge / Raise and refurbish existing	Neutral or Slight Adverse impact on surface and groundwater. Neutral effect on all remaining attributes.	No Change.
	Option 3A: New bridge / Demolish and replace existing - close subway	Neutral or Slight Adverse impact on surface and groundwater. Neutral effect on all remaining attributes.	No Change.
	Option 3B: New bridge / Demolish and replace existing - retain subway	Neutral or Slight Adverse impact on surface and groundwater. Neutral effect on all remaining attributes.	No Change.
Sub-scheme 5: Bittern Bridge Widening	Option 1: Tidal flow gantry system	No Change.	Eradication of Japanese knotweed means negligible beneficial effect on the built environment during operation.
	Option 2: Widening of existing bridge	Negligible adverse impact on surface water.	Eradication of Japanese knotweed means negligible beneficial effect on the built environment during operation.
	Option 3: Replacement (widening) of existing deck	Negligible adverse impact on surface water.	Eradication of Japanese knotweed means negligible beneficial effect on the built environment during operation.

ASSESSMENT OF DO MINIMUM/DO SOMETHING SCENARIOS

9.6.28 The overall impacts for each of the Do Minimum / Do Something scenarios for consideration are summarised below.

Do Minimum – Smart Motorways without Scheme

9.6.29 This scheme does not progress with any of the proposed improvements and would therefore have the lowest impact. However, this means Japanese Knotweed would not be dealt with and this invasive species would continue to spread, potentially causing damage to existing roadways in the future.

Do Something 1 - Dualling of A3024 Corridor

9.6.30 This option would have the largest cumulative impact due to requiring the most land take, construction, excavation and change in land usage. A beneficial effect of this option would be the eradication of Japanese Knotweed benefitting the local ecosystem.

Do Something 2 – Signalised Junction Improvements of A3024 Corridor

9.6.31 This scheme would still have a significant impact on soils and geology, but less than 'Do Something 1'.

Do Something 3 – Sub-scheme 1 Only

9.6.32 This option would have a very low impact as it involves carriageway widening within the existing highway boundary land.

9.7 INDICATION OF DIFFICULTIES ENCOUNTERED

9.7.1 The conclusions of this section are based on a high-level assessment of the effects the sub-scheme options are likely to have on soil, geological and geomorphological attributes; and constraints imposed by contaminated land receptors. The conclusions are based on indicative information and limited by the absence of site-specific Phase 2 ground investigation data.

9.7.2 It is recommended that a Phase 2 ground investigation be undertaken to generate such data as to confirm the anticipated ground conditions, identify and confirm potentially significant sources of land contamination and obtain the information necessary to permit detailed design, including testing to determine the appropriate concrete class to be utilised in construction.

9.7.3 Any future Phase 2 ground investigation should also aim to determine the waste classification and potential for re-use of soils. Japanese Knotweed should be treated to prevent potential future damage to built structures.

10 MATERIALS

10.1 INTRODUCTION

10.1.1 This section considers the effect of material resources use and the generation and management of waste associated with the Sub-schemes and sub-options as described in **Section 3**. IAN 153/11[294] provides guidance on the environmental assessment of material resources and this section is broadly based on this guidance. Material resources include the materials and construction products required for implementation of the proposed Sub-schemes, both raw materials and manufactured items.

10.1.2 Following review and assessment of each of the Sub-scheme options, the likely level of construction required for the four overall development options (i.e. Do Minimum, Do Something 1, Do Something 2 and Do Something 3) was derived. Some of the Sub-scheme options elements have the potential to use large amounts of raw materials and generate large quantities of waste. The consumption of material resources and the management of waste give rise to environmental impacts that need to be managed and mitigated.

10.1.3 This section does not cover impacts which occur off-site and may possibly occur outside the UK, including the depletion of non-renewable resources and the production of waste at the point of extraction and during manufacturing. These impacts are outside the scope of this assessment as they are likely to be subject to separate environmental assessment processes, such as those required to obtain consent to abstract the materials. The direct energy associated with the operation of the scheme, such as the energy use from lighting, is beyond the scope of this assessment.

10.2 ASSESSMENT METHODOLOGY

10.2.1 The guidance within IAN 153/11 states that a 'Simple Assessment' will be undertaken before detailed design. The simple assessment assembles data and information that is readily available to address potential effects identified before detailed design information is available. This level of assessment is considered appropriate for the Scoping Stage, however as the Sub-scheme options being assessed within this ESR are preliminary, it is considered appropriate to follow this high level assessment approach and due to the preliminary nature of information at this early design stage.

[294] Interim Advice Note (IAN) 153/11; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

10.2.2 IAN 153/11[295] identifies that it is not possible to provide detailed guidance on some aspects of the assessment process, such as the significance and magnitude of effect. Therefore this assessment follows the methodology set out in **Section 4** of this ESR[296]. The sensitivity of the receptor is dependent on the capacity of the local environment to provide materials or dispose of waste (i.e. the capacity of available waste management infrastructure). Predicted qualitative quantities of materials to be used and the waste forecasts, based on professional judgement, have been used to identify the magnitude of an impact. Using this high level professional judgement of significant and magnitude, an overall impact of each Sub-scheme option has been determined.

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

10.3 STUDY AREA

10.3.1 The study area comprises the anticipated maximum physical extent of the proposed options and the associated works, as well as the locations of waste management facilities and associated transportation networks within the administrative area of the Hampshire Authorities (assuming waste will remain within the Hampshire Authorities administrative area). It is noted that the locations and land take areas of construction compounds are not yet agreed and have therefore not been included as part of the study area.

10.3.2 Many material resources will originate off-site as described in **Section 10.1.3**, but others will arise onsite during construction such as excavated soil and rock or recycled elements of existing roads. The latter are included within the scheme boundary.

10.4 BASELINE CONDITIONS

MATERIALS GENERATED AND WASTE

10.4.1 The construction, demolition and excavation (CDE) sector is the largest contributing sector to the total waste generation in England and generated 77.4 million tonnes (Mt) of waste in 2010[297].

[295] Interim Advice Note (IAN) 153/11; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm
[296] Environmental Study Report
[297] Defra, 2013. *Waste Management Plan for England*. [online]. Accessed: 12/09/2016.

10.4.2 The objective in Hampshire authorities administrative area is to reuse, recycle and recover as much as possible of the estimated 2.35 Mt of CDE waste that is generated each year[298]. This is mostly made up of inert material such as concrete, rubble or soils[299]. This CDE waste comprises about 49% of the total waste arisings (by weight) in Hampshire[300]. Other waste streams in the Hampshire authorities administrative area include municipal solid waste (MSW), which contributes about 17% and commercial and industrial (C&I) waste, which contributes about 34% of the total waste arisings (by weight).

10.4.3 This is managed through a network of commercial waste transfer stations and materials recovery facilities, with the remainder going to landfill[301] (**Figure 10-1)**. It is recognised that there is a shortage of strategic waste management facilities in the UK and an increase in waste management infrastructure is required. Overall the Hampshire authorities administrative area currently has enough capacity to deal its waste[302].

10.4.4 The Sub-schemes and options may result in surplus material which may need to be disposed of as waste. In the case of options being considered here, this is most likely to include arisings from existing site materials (e.g. concrete and excavation of material from earthworks) and materials brought on to the site but not used for their intended purpose (e.g. damaged goods or over ordering of a certain material).

MATERIALS

10.4.5 The Hampshire authorities administrative area has local supplies of sand and gravel, silica sand, chalk, brick-making clay[303]. A large part of the Hampshire authorities administrative area is underlain by mineral deposits which may be required to meet the future needs for construction materials[304]. Soft sand and silica sand resources are scarcer compared to sharp sand and gravel[305]. Brick-making clay is important to maintain the productivity of Hampshire's brickworks[306].

10.4.6 The Hampshire authorities' administrative area also has deposits of chalk, other non brick-making clay, malmstone and clunch[307], but does not have hard rock or other specialist aggregates or minerals. These have to be imported into the county by sea or by rail[308].

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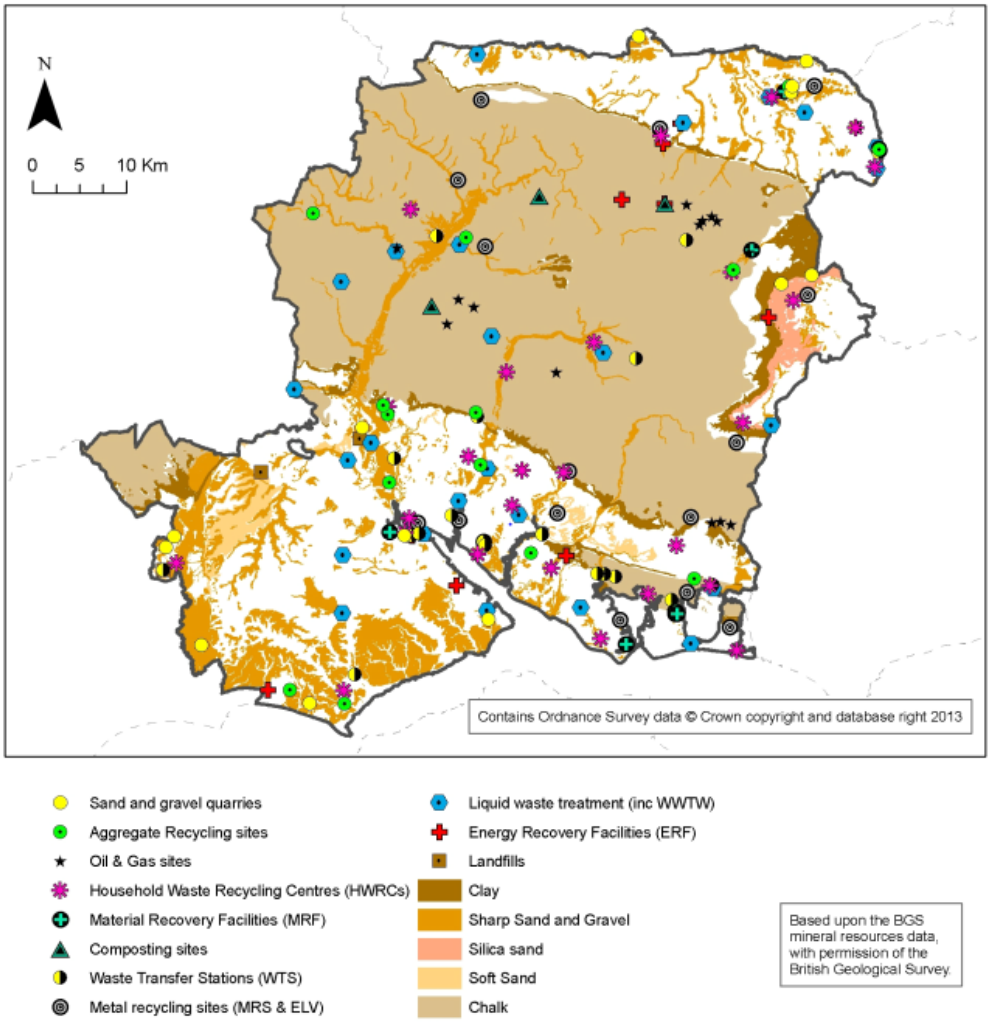
[298] Environment Agency, 2012. *Hampshire Mineral & Waste Plan, Assessment of Need for Waste Management Facilities in Hampshire: Waste Data Summary Report*. [online]. Accessed: 12/09/2016.
[299] Hampshire Authorities, 2013. *Hampshire Minerals and Waste Plan*, p. 110. [online]. Accessed: 14/09/2016.
[300] Environment Agency, 2012. *Hampshire Mineral & Waste Plan, Assessment of Need for Waste Management Facilities in Hampshire: Waste Data Summary Report*. [online]. Accessed 12/09/2016.
[301] Hampshire Authorities, 2013. *Hampshire Minerals and Waste Plan*, p. 96. [online]. Accessed: 14/09/2016.
[302] Hampshire Authorities, 2013. *Hampshire Minerals and Waste Plan*, p. 12. [online]. Accessed: 14/09/2016.
[303] Hampshire Authorities, 2013. *Hampshire Minerals and Waste Plan*, p. 12. [online]. Accessed: 14/09/2016.
[304] Hampshire Authorities, 2015. *Hampshire Minerals & Waste Plan, Minerals & Waste Safeguarding In Hampshire, Supplementary Planning Document*, p. 6. [online]. Accessed: 14/09/2016.
[305] Hampshire Authorities, 2015. *Hampshire Minerals & Waste Plan, Minerals & Waste Safeguarding In Hampshire, Supplementary Planning Document*, p. 14. [online]. Accessed: 14/09/2016.
[306] Hampshire Authorities, 2015. *Hampshire Minerals & Waste Plan, Minerals & Waste Safeguarding In Hampshire, Supplementary Planning Document*, p. 14. [online]. Accessed: 14/09/2016.
[307] Hampshire Authorities, 2015. *Hampshire Minerals & Waste Plan, Minerals & Waste Safeguarding In Hampshire, Supplementary Planning Document*, p. 14. [online]. Accessed: 14/09/2016.
[308] Hampshire County Council, 2013. *Hampshire Minerals and Waste Plan*, p. 12. [online]. Accessed: 14/09/2016.

10.4.7 **Figure 10-2** displays Hampshire authorities administrative areas main supply sources for minerals / aggregates, along with other important features including waste development interests and the principal constraints[309]. These minerals need to be managed carefully and used efficiently and their economic benefits need to be balanced with their environmental and social impacts.

10.4.8 The Sub-schemes and options will require materials to create and improve carriageways, bridges, footpaths and associated infrastructure. The options are likely to vary in terms of volumes of material usage but are likely to use the same broad categories of materials. These are likely to include primary materials, for example aggregates, and secondary recycled materials such as recycled concrete sourced on site.

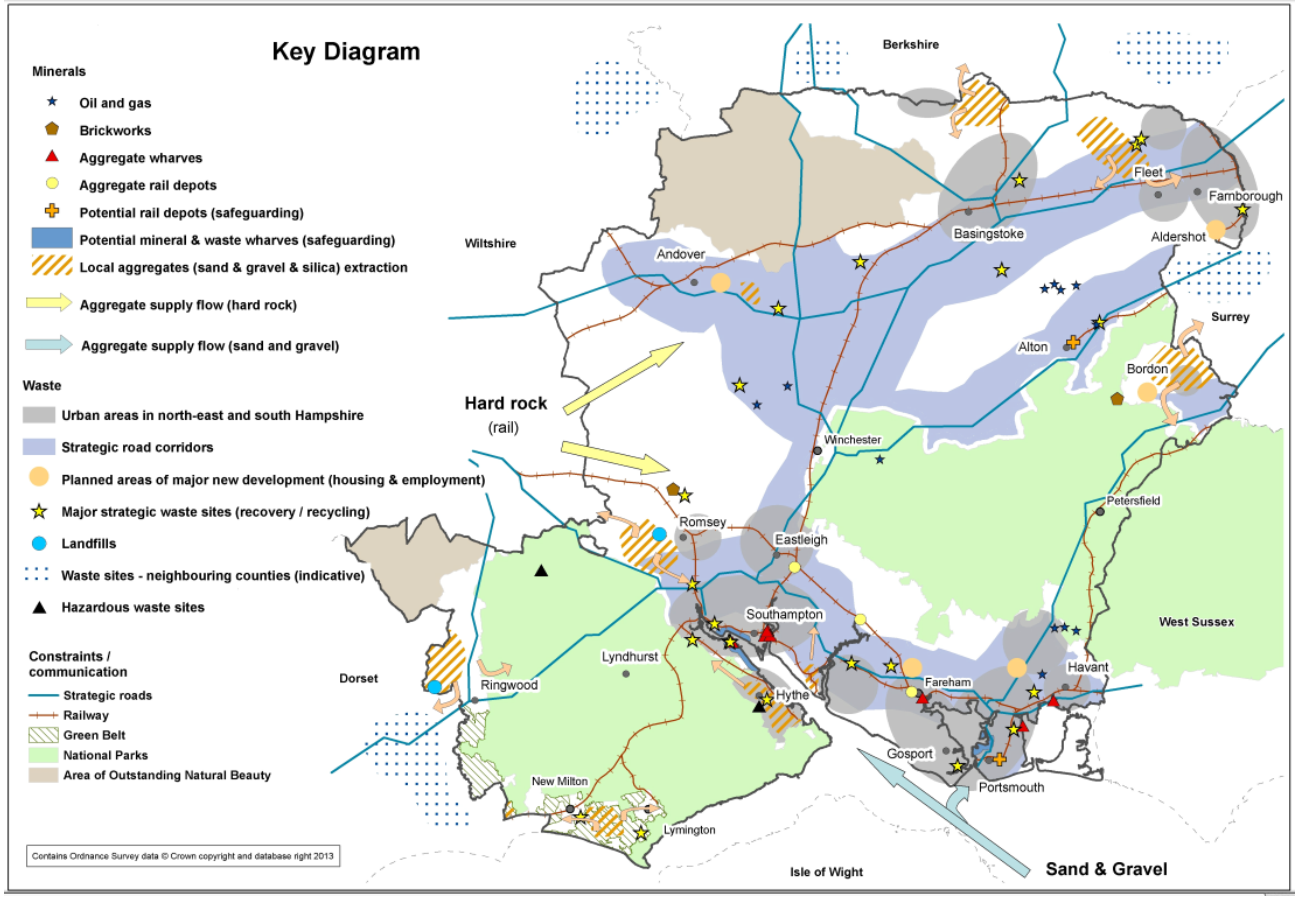
[309] Hampshire Authorities, 2013. *Hampshire Minerals and Waste Plan*, p. 22. [online]. Accessed: 14/09/2016.

Figure 10-1 Strategic waste infrastructure and mineral resources within the administrative area of the Hampshire Authorities[310].



[310] Hampshire Authorities, 2013. *Hampshire Minerals and Waste Plan*, p. 13. [online]. Accessed: 14/09/2016.

Figure 10-2 The Hampshire authorities administrative areas main supply sources for minerals / aggregates, waste development interests and principal constraints[311].



[311] Hampshire Authorities, 2013. *Hampshire Minerals and Waste Plan*, p. 22. [online]. Accessed: 14/09/2016.

10.5 REGULATORY AND POLICY FRAMEWORK

10.5.1 The overarching policy document for waste in Europe, the Revised Waste Framework Directive, sets a target for recycling and reuse of 70% for CDE[312] wastes by 2020. This requirement has been cascaded down at a national level within the Waste (England and Wales) Regulations 2011. England and the UK are already achieving an estimated 93% recovery rate of construction and demolition waste[313].

STATUTORY REQUIREMENTS

10.5.2 The *EU Waste Framework Directive 2008/98/EC* provides the overarching legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste. It lays down measures to protect the environment and human health by preventing or reducing the adverse effects resulting from the generation and management of waste and by improving the efficiency and reducing the overall impacts of resource use.

10.5.3 The Directive also mandates the Waste Hierarchy (**Figure 10-3**), which requires that where waste is unavoidable, products and materials should, subject to regulatory controls, be used again for the same or a different purpose (re-use). Otherwise resources should be recovered from waste through recycling. Value can also be recovered by generating energy from waste but only if none of the above offer an appropriate alternative solution.

Figure 10-3 The Waste Hierarchy[314].

10.5.4 The *EU Landfill Directive 1999/31/EC* sets stringent requirements for the landfilling of wastes. The key requirements of the Directive are:

- Separation of wastes through a classification approach to landfills: landfill for hazardous waste; landfill for non-hazardous waste and landfill for inert waste;
- Treatment of wastes prior to landfilling;

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[312] Construction Demolition and Excavation
[313] Defra, 2013. *Waste Management Plan for England*. [online] Accessed: 12/09/2016.
[314] European Commission, 2016. *Directive 2008/98/EC on Waste (EU Waste Framework Directive)*. [online] Accessed 15/09/2016.

- Banning of certain wastes from being landfilled;
- Reduction in the amount of biodegradable municipal waste going to landfill; and
- Landfill location requirements.

10.5.5 There are a number of primary legislative instruments in the UK on waste listed below which enact a wide range of secondary legislation that governs the storage, collection, treatment and disposal of waste:

- *The Control of Pollution Act (CoPA)1974;*
- *The Control of Pollution (Amendment) Act 1989;*
- *Environmental Protection Act 1990;*
- *The Environment Act 1995;*
- *The Finance Act 1996;*
- *Waste Minimisation Act 1998;*
- *The Waste and Emissions Trading Act 2003;*
- *The Clean Neighbourhoods and Environment Act 2005;*
- *The Waste (England and Wales) (Amendment) Regulations 2012 and 2014*

NATIONAL NETWORKS NATIONAL POLICY STATEMENT

10.5.6 The NN NPS[315]) requires that if a project is categorised as a NSIP[316] evidence of appropriate mitigation measures (incorporating engineering plans on configuration and layout, and use of materials) during both design and construction needs to be presented together with the arrangements for managing any wastes that are produced.

10.5.7 At PCF Stage 0 it was considered that, due to the majority of the Scheme being implemented on the local network, a DCO[317] would not be required. Therefore, the Sub-schemes and options are not considered to be an NSIP.

WASTE MANAGEMENT PLAN FOR ENGLAND (2013)

10.5.8 The Waste Management Plan for England is a high level document which is non-site specific and provides an analysis of the current waste management situation in England. It provides a planning framework to enable local authorities to put forward strategies that identify sites and areas suitable for new or enhanced waste management facilities to meet growing demand. Local Planning Authorities prepare local waste management plans as part of their Development Plan. Site-specific waste management plans are also prepared by contractors to control waste during construction, although they are not a legal requirement.

[315] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[316] Nationally Significant Infrastructure Project
[317] Development Consent Order

NATIONAL PLANNING POLICY FOR WASTE (OCTOBER 2014)

10.5.9 This document sets out detailed waste planning policies and states that all local authorities should have regard to its policies when discharging their responsibilities. The document provides guidance to local authorities on the following:

- Using a proportionate evidence base when preparing waste plans;
- Identifying the need for waste management facilities;
- Identifying suitable sites and areas for facilities; and
- How to determine waste planning applications.

HAMPSHIRE MINERALS AND WASTE PLAN 2013-2030

10.5.10 This Local Plan contains HCC[318], Portsmouth City Council, SCC[319], New Forest National Park Authority and the South Downs National Park Authority (the 'Hampshire Authorities') strategic vision for the management of Minerals and Waste until 2031.

10.5.11 The Plan contains a number of policies that the proposed M27 works would need to comply with in order to contribute to the county's strategic goals. The Plan aims to support economic growth by ensuring that a reliable source of minerals is maintained and waste is managed effectively and efficiently, whilst protecting the environment and the county's communities.

10.5.12 The Plan's policies are centred around:

- Sustainable minerals and waste development;
- Protecting the Hampshire Authorities environment;
- Maintaining the Hampshire Authorities communities; and
- Supporting the Hampshire Authorities economy.

10.5.13 The options should be in line with the strategic goals of this document in order to be compliant with county policy.

10.6 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

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

MITIGATION INCLUDED IN DESIGN

10.6.2 A number of standard mitigation measures will be incorporated within the design of the option or options that will be selected at a future date, to limit material and waste impacts of the scheme works and aim to reduce the requirement of additional imported materials. Currently there is not sufficient detail on the Sub-schemes and options to determine which mitigation would be appropriate for each Sub-schemes and options within this ESR.

[318] Hampshire County Council
[319] Southampton City Council

10.6.3 The Scheme will aim to minimise export and import of fill materials and to reuse as much as feasible of the existing structures within the Scheme boundary, such as metals and concrete from existing bridge structures. An example of how this could be achieved would be by balancing earthworks cut and fill volumes. Topsoil stripped as a result of the works will be reused wherever feasible in order to establish landscaping features such as embankments and verges as well as to provide a basis for landscape planting. Where existing surfaces are to be replaced, this material should be re-used as either a sub-base or included within new project construction.

10.6.4 The current Sub-schemes and options of the M27 Southampton Junctions improvements attempt to utilise as much of the existing carriageway and structures (bridges) as feasible. Maximising the use of the existing road and structures will reduce the requirement for materials and minimise the waste produced.

MITIGATION APPLIED DURING CONSTRUCTION

10.6.5 Mitigation during construction will be managed through the implementation of a Site Waste Management Plan (SWMP) for the preferred option at the detailed design stage, once it has been selected.

10.6.6 The SWMP will aim to ensure that the waste produced during the construction phase, in addition to other phases of the scheme, is dealt with in accordance with the Duty of Care Provisions in the EPA[320] (1990).

10.6.7 The reuse of cut material from earthworks activities will be employed to minimise the volume of imported fill required and the volume of waste removed from site for disposal. Using site-won material within the option will mitigate the potential impacts of importing large quantities of raw material whilst reducing associated haulage.

10.6.8 Materials imported to site will be sourced from client-approved suppliers and from the nearest available and suitable location, thus keeping HGV journey distances to a minimum.

DETAILED ASSESSMENT OF MATERIALS

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

- The EU Waste Framework Directive 2008;
- The Waste (England and Wales) (Amendment) Regulations 2012;
- National Planning Policy Framework 2012[321];
- Waste Prevention Programme for England 2013; and
- Hampshire Minerals and Waste Plan (2013)[322].

[320] Environmental Protection Act
[321] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2
[322] Hampshire Authorities, (2013). Hampshire Minerals and Waste Plan: [online] available at: http://documents.hants.gov.uk/mineralsandwaste/HampshireMineralsWastePlanADOPTED.pdf Accessed: 14/09/2016.

10.7 OVERALL ASSESSMENT

10.7.1 No information on the materials or waste generation associated with each of the Sub-scheme options is available at this early stage in the design process. In general it is assumed that options with a larger development footprint, larger scale ground works and those that require the construction or demolition of larger structures will produce a higher level of waste and require increased amounts of materials to complete.

SUB SCHEME 1 - M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

Option 1 – Localised Junction Widening

10.7.2 This option involves signalisation and localised widening at Windhover Roundabout and M27 Junction 8, and new NMU[323] facilities.

10.7.3 The A3024 Bursledon Road arm of the Windhover Roundabout, heading to Southampton, has some localised extensive carriageway widening on its eastern side to provide a separate designated slip road from the A3025 to the A3024. All other arms have smaller areas of localised carriageway widening. Further land take will be required for the construction of new cycling routes. Some earthworks will be required along the A27 south. The M27 Junction 8 improvement works include less extensive carriageway widening, mostly at the north east extent and less NMU facilities. Some earthwork will be required at the northern extent of the junction.

10.7.4 The material requirements of this option is expected to be less than other options which form part of Sub Scheme 1 as a result of the exclusion of large area of new offline carriageway. Carriageway widening would result in the production of waste material through clearance and excavation of predominantly vegetated areas within the existing highway boundary. New material will be required to construct the widened carriageway, NMU facilities and to provide new signalling.

10.7.5 This option is considered to have a Neutral or Slight Adverse impact on materials.

Option 2 – Through-about to A3024 Bursledon

10.7.6 This option involves the signalisation and localised widening of the M27 Junction 8 and new NMU facilities, as described above, with a variation to the improvement works around the Windhover Roundabout. Carriageway widening would result in the production of surplus material through clearance and excavation of predominantly vegetated areas within the existing highway boundary. New material would be required to construct the widened carriageway, NMU facilities and for new signalling.

10.7.7 This option proposes to construct a through-about lane across Windhover Roundabout linking the A3024 Bursledon Road. With the exception of the through-about, the associated level of surrounding carriageway widening would be similar to that of Option 1. The through-about would cause an extensive area of offline works which would increase the material requirements of the option. Site preparation for the offline sections of carriageway will produce material such as top soil and other spoil associated with the groundwork. If this material cannot be reused on the site, it will need to be transported to a waste facility. The woodland area within the roundabout would need to be cleared and the vegetative material disposed of or recycled.

[323] Non-Motorised User

10.7.8 At this high level assessment, this option is considered to have a Slight Adverse impact on materials, and would have a larger impact than Option 1.

Option 3 – Free-flow left-turn slip lanes at M27 Junction 8

10.7.9 This option involves signalisation and localised widening at Windhover Roundabout, the provision of dedicated left turning slip-lanes on all approaches of the M27 Junction 8 and new NMU facilities.

10.7.10 The Windhover Roundabout improvements are the same as those identified under Option 1. The provision of dedicated left turning slip-lands on all approaches of the M27 Junction 8 would require more significant offline carriageway construction and larger scale junction improvements compared to other proposed options for the M27 Junction 8. This option would involve large scale use of primary and secondary materials, new signalling and the provision of new safety barriers. Clearance and groundwork associated with the construction would produce material that may need to be disposed of as waste.

10.7.11 This option is considered to have a Slight Adverse impact on materials.

Option 4 – Through-about to A3025 Hamble Lane

10.7.12 This option is similar to Option 2 within this Sub-Scheme. It involves signalisation and localised widening of the M27 Junction 8 and new NMU[324] facilities with a variation to the improvement works around the Windhover Roundabout. Carriageway widening would result in the production of surplus material through clearance and excavation of predominantly vegetated areas within the existing highway boundary. New material will be required to construct the widened carriageway, NMU facilities and to provide new signalling.

10.7.13 This option proposes a through-about across Windhover Roundabout linking the A3025 to Hamble Lane. The associated impacts would be similar to Option 2. Localised carriageway widening and new NMU would result in the production of surplus material through clearance and groundwork, and would require new construction materials. The through-about would cause extensive of offline works which would increase the options material requirement and waste production. The woodland area within the Roundabout would need to be cleared and the vegetative material disposed of or recycled.

10.7.14 This option would have the same overall level of impact as Option 2 and is considered to have a Slight Adverse impact on materials.

Option 5 – Tunnel under Windhover Roundabout

10.7.15 This option includes the same improvements to M27 Junction 8 as Options 1, 2 and 4. The variation to this option is the construction of a tunnel under the Windhover Roundabout to link the A3024 to A3024 Bursledon Road.

10.7.16 Carriageway widening would result in the production of surplus material through the clearance and excavation of predominantly vegetated areas within the existing highway boundary. New material will be required to construct the widened carriageway, NMU facilities and to provide new signalling.

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[324] Non-Motorised User

10.7.17 Tunnelling under Windhover Roundabout would result in extensive site clearance for both widening and improvement works to existing carriageway, and from site preparation. The construction of a tunnel would greatly increase the amount of excavated materials and the material requirements of the option. Excavated materials would require disposal or reuse. Due to the amount of excavation required, it may not be feasible to use all the material on site and could increase demand pressure on waste management and disposal facilities. The option would have larger energy consumption through plant use and transportation of materials and waste, as well as the increased potential to cause nuisance and release contaminants.

10.7.18 This option is considered to have a Moderate Adverse impact on materials, and is expected to have the largest impact on material of all the Sub Scheme 1 options. Compared to options involving the construction of new bridge structures, this option is believed to be comparable because of the production of excess soil during excavations, the disruption to the existing roundabout, and the large requirements of materials.

SUB SCHEME 2 – A3024 EASTERN ACCESS CORRIDOR

10.7.19 Three options for increasing capacity and reducing journey times along the A3024 corridor have been identified. Northam Rail Bridge (Sub Scheme 3) and Bitterne Rail Bridge (Sub-scheme 5) sections are considered separately under different Sub Schemes.

Level 1: Signal control improvements

10.7.20 Level 1 improvements include UTC[325] and traffic signal controller reconfiguration at signalised junctions to enable GO[326] to eliminate running side roads for longer green times than required. Existing kerblines and traffic signal infrastructure are to be retained.

10.7.21 The material requirements for this option are expected to be minimal and less than other options which form part of Sub-scheme 2. The main material requirements will be new signalling equipment. The option will result in the production of waste arising from a number of activities, including damage to materials and products, off-cuts and packaging. The potential environmental impacts for waste are associated with its production, storage, transport, processing and disposal. The waste produced from this option would be minimal.

10.7.22 This option is considered to have a Neutral impact on materials.

Level 2: Junction and signal improvements

10.7.23 Level 2 improvements include Introduction of UTMC[327] MOVA[328] signal control at signalised junctions with ability to switch to UTC[329] control if conditions require. The work will include minor changes to kerblines at junctions (introducing flares and turning pockets) to improve localised stop-line capacity.

10.7.24 The material requirements for this option are expected to be minimal. The main material requirements will be new signalling equipment and materials for the localised improvement of carriageway. Minimal waste material from clearance and excavation is expected. Other waste material would include damaged materials and products, off-cuts and packaging.

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[325] Urban Traffic Control
[326] Gap Out
[327] Urban Traffic Management Control
[328] Microprocessor Optimised Vehicle Actuation
[329] Urban Traffic Control

10.7.25 This option is considered to have a Neutral impact on materials.

Level 3: Dualling full A3024 corridor

10.7.26 Overall, Level 3 improvements comprises of the introduction of UTMC MOVA signal control at signalised junctions with ability to switch to UTC if conditions require. Changes are also proposed to kerblines and carriageway widening to ensure two lanes per direction along the entire A3024 corridor.

10.7.27 The carriageway widening, particularly east and west of Northam Rail Bridge, Bath Road junction along A3024 Bursledon Road and at Botley Road, would result in substantial amounts of land take. In order for construction to take place, areas of vegetation, comprising mainly of grass, shrubs and woodland would need clearance and soil would need excavating. The extent of offline widening would encompass developed land, including housing and hard standing. This site preparation would result in large amounts of waste material, which would be reused on the scheme were feasible. For surplus waste arising from the site and materials that cannot be reused, the potential environmental effects are associated with their movement, transport, processing, and disposal. This would have a negative impact on local waste management infrastructure through increase demand pressure and reduced overall future capacity.

10.7.28 For material resource use, the potential environmental effects of the scheme at are mainly associated with their transport to and use on the sites. The scheme has large sections of offline construction, which would increase the material consumption considerably when compared to online options. This is because large amounts of primary and secondary materials would be required for the construction of new section of carriageway and its supporting infrastructure. This impact is greater for longer length of offline alignments. Material consumption would include finite primary aggregates (e.g. sands and gravels), drainage and signage products.

10.7.29 This option is considered to have a Slight or Moderate Adverse impact on materials.

SUB SCHEME 3 – NORTHAM RAIL BRIDGE REPLACEMENT

Option 1 – New bridge / Refurbish existing

10.7.30 This option involves constructing a new two lane bridge and footpath cycleway on the north side of the existing bridge and strengthening the existing bridge to accept two lanes of unrestricted traffic.

10.7.31 Amendments to the existing road network would be required. This would involve some demolition of the existing carriageway for the new alignment and some additional land take of mainly vegetated areas. The resulting material would include bitumen, general construction materials and green waste / vegetation. Demolition material has the potential to be reused elsewhere, potentially alleviating the need for landfill. Any materials that are not required for use on the site would become waste. This would have potential impacts, including the consumption of landfill and waste treatment capacity and the movement of vehicles transporting waste arising's to final destinations.

10.7.32 New materials would be required for the new carriageway, the refurbishment of the existing bridge and for the new bridge. The material resource requirement for the new bridge would be considerable.

10.7.33 The material requirements and waste production of the option are expected to be less than other Sub-Scheme 3 options. This is a result of the increased online work (refurbishment of the existing bridge and realignment of existing carriageway), as oppose to bridge demolition and construction.

10.7.34 The option is considered likely to have a Slight or Moderate Adverse impact on materials.

Option 2 – New bridge / Raise and refurbish existing

10.7.35 Option 2 involves constructing a new two lane bridge and footpath cycleway on the north side of the existing bridge and strengthening the existing bridge to accept two lanes of unrestricted traffic. The existing bridge is also to be raised to increase headroom above the tracks below.

10.7.36 The impacts associated with this option would be similar to those identified for Option 1 above. This option would require further material input in order to raise the headroom of the existing bridge. Any surplus material associated with this additional work would be disposed of as waste or be reused.

10.7.37 The option is considered likely to have a slightly larger impact than Option 1 of this Sub-scheme, and have a Moderate Adverse impact on materials.

Option 3A – New bridge / Demolish and replace existing - close subway

10.7.38 This option involves constructing a new two lane bridge and footpath cycleway on the north side of the existing bridge, and the removal and replacement of the existing bridge structure. Amendments to the existing road network would be required. This would involve some demolition of the existing carriageway for the new alignment and additional land take of mainly vegetated areas. The resulting material would include bitumen, general construction materials and green waste / vegetation. The demolition of the existing bridge is likely to result in concrete and steel arisings. Demolition material has the potential to be reused elsewhere, potentially alleviating the need for landfill. Any materials that are not required for use on the site would become waste. This would have potential impacts, including the consumption of landfill and waste treatment capacity and the movement of vehicles transporting waste arising's to final destinations.

10.7.39 A large amount of new materials would be required for the new carriageway and bridges. The material resource requirement for the new bridge would be considerable and the type of material requirement would depend on the final design. The material requirements and waste production for this option is expected to be greater than other Sub Scheme 3 options as a result of the increased construction requirements.

10.7.40 The option is considered likely to have a Moderate Adverse impact on materials.

Option 3B - New bridge / Demolish and replace existing - retain subway

10.7.41 This option is broadly similar to Option 3A, however, it retains and extends the subway. This option would therefore have a reduced impact on material as slightly less demolition waste would be created and the need for new construction materials to provide an alternative NMU[330] route would be reduced.

10.7.42 This reduction in material requirement and waste production is not expected to reduce to magnitude of impact sufficiently to reduce the predicted impact identified for Option 3A. As such, the option is considered likely to have a Moderate Adverse impact on materials.

SUB SCHEME 5 – BITTERNE RAIL BRIDGE WIDENING

10.7.43 This Sub-scheme involves providing a minimum of 2 lanes per peak direction across the bridge, which is currently narrow and operates as a single wide lane per direction.

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[330] Non-Motorised User

Option 1 - Tidal flow gantry system

10.7.44 This option involves tidal flow signalisation of Bitterne Road over the Bitterne Rail Bridge with a requirement for gantries.

10.7.45 The material requirements for this option are expected to be minimal and less than other options which form part of Sub -scheme 5. The main material requirements will be new signalling equipment. The option will result in the production of waste arising from a number of activities, including damage to materials and products, off-cuts and packaging. The potential environmental impacts for waste are associated with its production, storage, transport, processing and disposal. The waste produced from this option would be minimal.

10.7.46 This option is considered to have a Neutral impact on materials.

Option 2 - Widening of existing bridge

10.7.47 This option involves localised widening to the north of Bitterne Rail Bridge, resulting in land take. Amendments / realignments to the existing road network would be required. This would involve demolition of the existing carriageway for the new alignment and some additional land take of mainly vegetated areas. The bridge edge beams would need to be removed. Demolition / removed materials have the potential to be reused elsewhere, potentially alleviating the need for landfill. Any materials that are not required for use on the site will become waste. This will have potential impacts, including the consumption of landfill and waste treatment capacity and the movement of vehicles transporting waste arising's to final destinations.

10.7.48 The construction of the widened section of carriageway and bridge will require new material including concrete and steel. The material requirements and waste production of this option is expected to be greater the Option 1 within this Sub Scheme due to the carriageway widening, but less than Option 3.

10.7.49 The option is considered likely to have a Slight or Moderate Adverse impact on materials.

Option 3 - Replacement (widening) of existing deck

10.7.50 This option is similar to Option 2 detailed above, with no difference in highways alignment and land take. The difference in regards to materials is the replacing of the existing deck with a new steel composite deck. The removal of the existing desk would cause increased amounts of waste and to replacing the desk would require increased amounts of materials.

10.7.51 The option is considered likely to have a Moderate Adverse impact on materials.

10.7.52 The overall impacts for each of the four development option scenarios for consideration are discussed below.

ASSESSMENT OF DO MINIMUM/DO SOMETHING SCENARIOS

Do Minimum – Smart Motorways without Scheme

10.7.53 This development option encompasses no Sub-Scheme options. There is not expected to be a material requirement for this Do Minimum option.

10.7.54 This option is considered to have a Neutral impact on materials.

Do Something 1 – Dualling of A3024 Corridor

10.7.55 This development option involves the combination of Sub Scheme 1 Option 1, Sub Scheme 2 Level 3, Sub Scheme 3 Option 3A, and Sub Scheme 5 Option 1.

10.7.56 Signalisation and localised carriageway widening at Windhover Roundabout, M27 Junction 8, Bitterne Road and Bitterne Rail Bridge, and along the entire A3024 corridor as well as new NMU[331] facilities will result in significant amounts of land take. The land take will include areas of vegetation, comprising mainly of grass, shrubs and woodland and developed land, including housing and hard standing. This site preparation would result in large amounts of waste material.

10.7.57 Further works would be required to widen the existing bridge over the Bitterne railway and the joining carriageway to implement a new alignment. This would cause concrete and steel arisings. The proposal to amend the A27 Wide Lane rail-over bridge portal to increase the head height and width would result in further material requirements and waste produced by this option.

10.7.58 Material arising during site preparing has the potential to be reused elsewhere, potentially alleviating the need for landfill. Any materials that are not required for use on the site would become waste. This would have potential impacts, including the consumption of landfill and waste treatment capacity and the movement of vehicles transporting waste to final destinations.

10.7.59 The development option has large sections of offline construction, which will increase the material consumption considerably when compared to the Do Minimum option. This effect becomes increasingly more significant for longer length of offline alignments. New material would be required to construct the widened carriageway, bridge, NMU facilities and to provide new signalling. For material resource use, the potential environmental effects of the Option at are mainly associated with their transport to and use on the construction site.

10.7.60 It is considered that this Option would have a Moderate or Large Adverse impact on waste and materials.

Do Something 2 – Signalised Junction Improvements of A3024 Corridor

10.7.61 This development option involves the combination of Sub Scheme 1 Option 1, Sub Scheme 2 Level 1, Sub Scheme 3 Option 3A, and Sub Scheme 5 Option 1. This is similar to the Do Something 1 Option, but includes Sub Scheme 2 Level 1, oppose to Level 3.

10.7.62 Signalisation and localised carriageway widening at Windhover Roundabout, M27 Junction 8, Bitterne Road and Bitterne Rail Bridge, and improved signalisation along the A3024 corridor as well as new NMU facilities would cause localised areas of land take. This land take would predominantly include areas of vegetation, comprising mainly of grass, shrubs and woodland and some hard standing. Site preparation would result in large amounts of waste material.

10.7.63 Further works would be required to widen the existing bridge over the Bitterne railway and the joining carriageway to implement a new alignment. This would result in concrete and steel arisings. The proposal to amend the A27 Wide Lane rail-over bridge portal would result in further material requirements and waste produced by this option.

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[331] Non-Motorised User

10.7.64 Material arising during site preparing has the potential to be reused elsewhere, potentially alleviating the need for landfill. Any materials that are not required for use on the site will become waste. This will have potential impacts, including the consumption of landfill and waste treatment capacity and the movement of vehicles transporting waste to final destinations.

10.7.65 New material will be required to construct the widened carriageway, bridge construction, NMU[332] facilities and to provide new signalling. For material resource use, the potential environmental effects of the option at are mainly associated with their transport to and use on the construction site.

10.7.66 It is considered that this option would have a Moderate Adverse impact on waste and materials.

Do Something 3 – Sub-scheme 1 Only

10.7.67 This development option comprises only Sub Scheme 1, Option 1.

10.7.68 This development option involves signalisation and localised widening at Windhover Roundabout and M27 Junction 8, and new NMU facilities. This would result in some localised extensive carriageway widening and the provision of new cycling route.

10.7.69 The material requirements of this option are expected to less than other options which comprise large area of new offline carriageway. Carriageway widening would result in the production of surplus material through clearance and excavation of predominantly vegetated areas within the existing highway boundary. New material will be required to construct the widened carriageway, NMU facilities and to provide new signalling.

10.7.70 This option is considered to have a Neutral or Slight Adverse impact on materials.

SUMMARY

10.7.71 The material resources assessment has been undertaken using professional judgement. The use of materials including the management of waste may also give rise to other impacts, which might include detrimental impacts on air and water quality, and increased noise. These impacts have been assessed within other sections.

10.7.72 A summary of the determined impact on materials for each Sub-scheme option is provided within **Table 10-1** below.

Table 10-1 The impact on materials for Sub-scheme option.

Sub-schemes	Options	Impact	
		Construction	Operation
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades	Option 1	Neutral or Slight Adverse	N/A
	Option 2	Slight Adverse	
	Option 3	Slight Adverse	
	Option 4	Slight Adverse	
	Option 5	Moderate Adverse	
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1	Neutral	
	Level 2	Neutral	
	Level 3	Slight or Moderate	

[332] Non-Motorised User

Sub-schemes	Options	Impact	
		Construction	Operation
		Adverse	
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1	Slight or Moderate Adverse	
	Option 2	Moderate Adverse	
	Option 3A	Moderate Adverse	
	Option 3B	Moderate Adverse	
Sub-scheme 5: Bittern Bridge Widening	Option 1	Neutral	
	Option 2	Slight or Moderate Adverse	
	Option 3	Moderate Adverse	

10.8 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

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

11 NOISE AND VIBRATION

11.1 INTRODUCTION

11.1.1 This section provides an assessment of the potential noise and vibration impacts arising from the construction and operation Sub-schemes and Sub-scheme Options. The assessment also considers the potential magnitude of impacts likely to arise from the three Do Something Scenarios Options (as described in **Table 3-1**). This section considers impacts on human receptors; the potential impacts of noise and vibration on flora and fauna, are considered in **Section 8**. The scheme is at an early stage in the design process, so limited scheme information is available at this time (PCF Stage 1), although some preliminary traffic data have been extracted from the SRTM[333]. This assessment identifies the magnitude of potential impacts and supports the option selection process. All findings in this section should be considered preliminary.

11.1.2 The scheme options, including the sub-scheme options, have the potential to affect operational noise and vibration levels experienced at nearby sensitive receptors due to changes in the road layout and any associated changes in vehicle flow, speed and mix. Both aspects are considered in this section.

11.1.3 A glossary of acoustics terminology is presented in **Appendix C-1**.

11.2 ASSESSMENT METHODOLOGY

COLLECTION OF BASELINE INFORMATION

11.2.1 A noise survey was undertaken on Wednesday 6 July 2016 to establish the current noise climate close to the A3024 eastern access corridor. The survey methodology followed the shortened measurement procedure described in the Calculation of Road Traffic Noise (CRTN) over three consecutive hours between 10:00 and 17:00 hours on a typical weekday. The following noise descriptors – L_{A10} , L_{A90}, L_{Aeq}, L_{Amax} – have been reported (see **Table 11-8**). **Table 11-1** describes the noise survey locations which are also illustrated in **Figure 11-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0018).

Table 11-1 Measurement Locations

Measurement Location	Approximate Location Adjacent to A3024	Distance from the A3024 Carriageway
ML1	South of A3024, c100m east of Brintons Road [OSGB 442715, 112203]	4.0m
ML2	South of A3024, c170m east of Bitterne Road [OSGB 444926, 113077]	6.7m
ML3	North of A3024, c60m south-east of Upper Deacon Road [OSGB 445818, 112534]	15.0m
ML4	South of A3024, c280m south-east of Botley Road [OSGB 447562, 111167]	9.4m

[333] Sub-Regional Transport Model

11.2.2 The weather conditions during the survey were conducive to environmental noise monitoring, being dry and warm, with low wind speeds.

Figure 11-1 Noise Monitoring Locations and Noise Important Areas

11.2.3 **Table 11-2** describes the equipment used in the survey. Class 1 Sound Level Meters (SLMs) were used to undertake the measurements under free-field conditions and at a height of approximately 1.4m above the ground level.

Table 11-2 Noise Survey Equipment

Measurement Locations	Equipment	Type	Serial Number	Calibration Due Date
ML1 and ML3	Meter	01dB-METRAVIB Solo Master	60845	22 March 2017
	Pre-amplifier	01dB-Stell PRE 21 S	17035	
	Microphone	Microtech Gefell GmbH MCE212	182024	
	Calibrator	01dB-Stell Cal 21	51031216	01 July 2017
ML2 and ML4	Meter	01dB-METRAVIB Solo Master	65806	10 November 2017
	Pre-amplifier	01dB-Stell PRE 21 S	16461	
	Microphone	Microtech Gefell GmbH MCE212	166412	
	Calibrator	01dB-Metravib Cal 21	34323904	08 August 2017

11.2.4 Noise Important Areas (NIAs) within close proximity of the scheme have been identified using the government website – www.data.gov.uk (See **Table 11-3**).

11.2.5 Notional and potentially affected noise sensitive receptors (NSR's), representative of others nearby, have been identified using available mapping and aerial photography, supplemented by observations made on site (see **Table 11-4** to **Table 11-7**).

ASSESSMENT APPROACH

11.2.6 A predominately qualitative assessment has been undertaken at this stage (PCF Stage 1), based on available information and professional judgement. However, some basic noise level predictions have been undertaken using available traffic data.

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

- specific construction activities (for example piling, bridgeworks or extension of an existing underpass) that could generate notable noise and/or vibration impacts;
- construction activities that need to be undertaken at night (e.g. track possession for works over the rail line); and
- heavy and/or vibration generating construction plant operating sufficiently close to sensitive receptors to generate notable impacts.

11.2.8 With respect to permanent operational impacts, the following factors that might affect the level of road traffic noise at any receptor have been identified:

- traffic related;
- road related;
- propagation; and
- receptor specific.

11.2.9 The available traffic data have been used to determine the impact that changes in vehicle flow, speed and mix might have on received noise levels. Consideration has also been given to whether realigned links might result in road traffic sources moving closer to nearest NSRs[334]. Potential design, mitigation and enhancement measures have also been identified.

11.2.10 This qualitative assessment provides an indication of the potential magnitude of impact during construction and operation for each sub-scheme. At this stage no consideration has been given to the likely significance of effects. The adopted approach allows the potential impacts arising from the different sub-schemes and associated alternatives to be compared and contrasted.

11.3 STUDY AREA

11.3.1 During later PCF stages, when sufficient data are available, a robust quantitative assessment will be undertaken. This will consider a study area defined in accordance with the methodology contained in DMRB[335] HD213/11. Such a study area is appropriate where all necessary data are available to facilitate the road traffic noise calculations. However, for this assessment, which is based on more limited information, it is considered appropriate to utilise a smaller study area focussed on each sub-scheme and the immediate proximity of potentially affected NSRs, most of which are dwellings.

11.4 BASELINE CONDITIONS

NOISE CONSTRAINTS

11.4.1 The scheme consists of four sub-schemes, three of these (sub-schemes 2, 3 and 5) lie within the Southampton agglomeration, with many residential receptors lying within 100m of a given sub-scheme road centreline. The exception is sub-scheme 1 to the east (the M27 Junction 8 and Windhover roundabout) which has a more rural aspect and where residential receptors are fewer in number and set further back from the works.

11.4.2 There are multiple overlapping NIAs close to the four sub-schemes, as shown in **Figure 11-1 (**Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0018).

11.4.3 **Table 11-3** presents the NIAs and the associated sub-scheme options that have the potential to adversely affect them.

[334] Noise Sensitive Receptors
[335] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

Table 11-3 Noise Important Areas

Sub-scheme	NIA	Location [1]	NIA Type and Owner
[SS1] M27 Junction 8 and Windhover Roundabout	5569	Overlap	Road (Highways England)
	6207		
[SS2] A3024 Eastern Access Corridor	2204		Road (Southampton)
	2205		
	2206		
	2207		
	2242		
	12264	Nearby	
	2251	Overlap	
	2210		
[SS3] Northam Rail Bridge		Nearby	
	RI_369	Overlap	Rail (Rail Authority)
	12661		Road (Southampton)
[SS5] Bitterne Bridge	2251		

Note:
1] The entries in this column identify whether the NIA actually overlaps the scheme extents or lies nearby (i.e. within about 100m)

11.4.4 **Figure 11-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0018) and the tables below identify notional, representative NSRs[336], along with the approximate distance of the NSR to the works, the broad direction (from the works to NSR) and whether that NSR lies within a NIA. Sub-scheme 2, the eastern access corridor has been broken down into a number of sections described by adjoining side roads or notable feature.

Table 11-4 Noise Sensitive Receptors – Sub-scheme 1 – M27 Junction 8 and Windhover Roundabout

Sub-scheme 1	Receptor	Distance (M)	Direction	NIA
M27 Junction 8	SS1a, Peewit Hill	130	NW	5559
	SS1b, Dodwell Lane N	85	NE	
	SS1c, Dodwell Lane S	50	SE	
	SS1d, Windmill Lane	27	SW	6207
Windhover Roundabout	SS1e, West End Road	17	N	
	SS1f, Windmill Lane	100	E	
	SS1g, Devonshire Gardens	78	S	
	SS1h, Woolwich Close	>200	SW	
	SS1i, Bursledon Road	>400	NE	

[336] Noise Sensitive Receptors

Table 11-5 Noise Sensitive Receptors – Sub-scheme 2 – Eastern Access Corridor

Sub-scheme 2	Receptor	Distance (m)	Direction	NIA
Northam Rail Bridge	See sub-scheme 3	-	-	-
Princes St to River Itchen	SS2a, Northam Road	18	E	2210
Bitterne Bridge	See sub-scheme 5	-	-	-
Bitterne Rd East	SS2b, Milbury Crescent	10	E	
Bursledon Rd to Ruby Rd	SS2c, Bursledon Road	18	N	2207
	SS2d, Bursledon Road	8	S	2207
	SS2e, Bursledon Road	6	S	2207
Ruby Rd to Upper Deacon Rd	SS2f, Bursledon Road	36.5	N	
	SS2g, Bursledon Road	5	S	2207
	SS2h, Bursledon Road	18.5	S	
Upper Deacon Rd to Hinkler Rd	SS2i, Bursledon Road	27	N	
	SS2j, Barry Road	26.5	N	
	SS2k, Bursledon Road	5	S	2206
	SS2l, Bursledon Road	10	S	2206
	SS2m, Springwell School	32	N	
Hinkler Rd to Gavan St	SS2n, Carey Road	37.5	N	
	SS2o, Carey Road	23	N	
	SS2p, Bursledon Road	13	N	
	SS2q, Kathleen Road	6	S	
	SS2r, Anson Drive	28	S	
Orpen Rd to Warburton Rd	SS2s, Lydgate Road	12	N	2205
	SS2t, Lydgate Road	23	N	
	SS2u, Ivy Dene	23	S	
	SS2v, Bursledon Road	11	S	
Warburton Rd to Botley Rd	SS2w, Warburton Road	21,5	N	
	SS2x, Bursledon Road	11.5	N	
	SS2y, Bursledon Road	3	S	2204
	SS2z, Bursledon Road	9.5	S	

Table 11-6 Noise Sensitive Receptors – Sub-scheme 3 – Northam Rail Bridge

Sub-scheme 3	Receptor	Distance (m)	Direction	NIA
Northam Rail Bridge	SS3a, Wolverton Road	17	NW	
	SS3b, Radcliffe Road	45	NE	
	SS3c, Northam Road	45	SW	RI_369

Table 11-7 Noise Sensitive Receptors – Sub-scheme 5 – Bitterne Bridge

Sub-scheme 5	Receptor	Distance (m)	Direction	NIA
Bitterne Bridge	SS5a, Chafen Road	4	NW	2251
	SS5b, Bitterne Road West	3.5	SW	2251
	SS5c, Bitterne Road West	3	SE	2251

EXISTING NOISE LEVELS

11.4.5 A summary of the baseline noise survey results is presented in **Table 11-8**. The results presented are as measured and have not been adjusted to a notional reference distance. The $L_{A10,18h}$ has been calculated following the methodology described in the CRTN, based on the following relationship: $L_{A10,18h} = L_{A10,3h} – 1$ dB.

Table 11-8 Noise Survey Results – Wednesday 06 July 2016

Measurement Location	Start Time	$L_{A90,1h}$ dB	$L_{Aeq,1h}$ dB	$L_{A10,1h}$ dB	$L_{A10,18h}$ dB
ML1 (c4.0m from A3024 kerb)	10.00	59.6	69.3	72.6	71.4
	11.00	58.4	69.2	72.4	
	12.00	58.7	69.0	72.3	
ML2 (c6.7m from A3024 kerb)	10.00	57.7	68.0	72.1	71.0
	11.00	57.8	68.2	72.1	
	12.00	56.8	67.9	71.7	
ML3 (c15.0m from A3024 kerb)	13.45	55.1	67.3	69.2	68.3
	14.45	56.6	67.7	69.3	
	15.45	56.1	69.6	69.3	
ML4 (c9.4m from A3024 kerb)	13.45	56.4	70.9	72.4	70.0
	14.45	58.9	68.4	71.2	
	15.45	58.1	68.1	69.4	

11.4.6 For each location, a graphical representation of the measurement results is presented in **Appendix C-2**.

11.4.7 From on-site observations it can be concluded that for the scheme as a whole, road traffic is the dominant source affecting the existing noise climate, although locally rail movements and commercial uses will also contribute. It can be seen from the results in **Table 11-8** that the existing noise levels generally fall within the range 68-71 dB $L_{A10,18h}$ at locations close to the A3024 (i.e. within approximately 4m to 15m).

11.4.8 The noise survey data presented in this report could be compared against the outputs from any noise model prepared during a later PCF Stage, when the scheme options are refined and comprehensive traffic data are available.

11.5 REGULATORY AND POLICY FRAMEWORK

11.5.1 This assessment has been undertaken to identify the magnitude of potential impacts and support the option selection process. To this end the regulatory, policy and technical guidance outlined in **Appendix C-3** has been utilised. Subject to relevant updates and revisions the same guidance will be used throughout the PCF process to shape and influence the assessment of noise and vibration impacts arising from the scheme during construction and operation.

11.6 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

CONSTRUCTION

11.6.1 The noise and vibration impacts arising during construction can be mitigated to an extent through contractual means. Contract conditions can be used to limit noise from a construction site, to control working hours (especially for potentially disruptive operations), to prevent access to sensitive areas, and to restrict construction traffic to suitable haul routes, etc. It is important that contractual working restraints are discussed in advance with the Environmental Health Officer (SCC[337]). Monitoring of noise and vibration may be required during construction.

11.6.2 The CoPA[338] Section 61 sets out procedures for those undertaking works to obtain 'prior consent' for construction works. Applications for such consent are made to the relevant local authority and contain a method statement for the works and the steps to be taken to minimise noise and vibration. Under Section 60 of CoPA, the local authority has powers to serve a notice imposing requirements as to the way in which the works are to be carried out and may specify plant or machinery which is (or is not) to be used, the hours during which the works may be undertaken and the level of noise or vibration which may be emitted at any specified point. Although it is generally for those undertaking the works to decide whether or not to seek a Section 61 consent, this is also dependent on the custom and practice of the local authority. Some local authorities request demonstration of Best Practicable Means (BPM) rather than a formal 'prior consent' application.

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

11.6.4 It will be important to manage and control noise and vibration throughout the construction period and to this end a mitigation strategy will be developed at a later stage in the design process, once information is available regarding how the Scheme might be constructed. It is anticipated that this mitigation strategy would be formalised within a CEMP[339], or similar, developed by the Principal Contractor in liaison with SCC. The CEMP would include, but not necessarily be limited to, the following:

- environmental management responsibilities and activities;
- monitoring and auditing processes;
- complaints handling and response procedures; and

[337] Southampton City Council
[338] Control of Pollution Act
[339] Construction Environmental Management Plan

- community and stakeholder liaison processes.

11.6.5 During the construction phase, it is recommended that all contractors should apply BPM to minimise any residual noise impacts. Some general methods of noise control are included in **Appendix C-4**.

OPERATION

11.6.6 With respect to the mitigation of road traffic noise in general, a number of measures are available, which might be applied either in isolation or in combination, to mitigate the adverse impacts of road traffic noise in the operational phase. Some of these generic measures are set out below.

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

11.6.7 These measures are considered further in **Appendix C-5**.

11.6.8 Given the urban nature of the scheme and the various constraints that exist (for example, limited space, the need to maintain access and low traffic speeds), the opportunities to influence noise levels through design are likely to be limited for this scheme. Consequently, it is important that due consideration is given to all opportunities to introduce mitigation into the scheme design.

11.7 OVERALL ASSESSMENT

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

TEMPORARY CONSTRUCTION IMPACTS

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

11.7.3 The following are generally applicable to temporary construction related impacts:

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

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

11.7.5 Some of the sub-schemes may require the temporary use of local diversion routes or other traffic management measures such as signal control and so receptors in proximity to such routes may experience increased levels of noise and possibly vibration too. Furthermore, where works occur in the vicinity of live traffic, vehicle speeds are often restricted for safety reasons. Any resultant decrease in speed might lead to a temporary reduction in road traffic noise level at nearby NSRs[340].

11.7.6 Certain activities and operations are more likely than others to generate notable levels of noise and vibration (for example, piling, or large scale earthworks). Hence, these should be identified at the earliest opportunity, along with the likelihood of any night-working, as the prospect of disturbance is increased. Since two of the four sub-schemes involve the replacement or widening of rail over-bridges, it seems likely that track possessions will be required. This could result in works being undertaken during the night.

11.7.7 The following tables provide some qualitative comments on the likely magnitude of impacts for each sub-scheme and alternatives within each sub-scheme. It should be noted that these comments are not based on any objective, quantitative analysis, but are subjective and rely on experience.

Table 11-9 Assessment of Temporary Construction Phase Impacts – Sub-scheme 1

		M27 Junction 8 Options and Descriptions	
		Localised widening, signalisation, full NMU facilities	Dedicated left turn slip lanes on all approaches
Windhover Roundabout Options and Descriptions	**Localised widening, signalisation, full NMU[341] facilities**	Option 1	Option 3
	Localised widening, signalisation, full NMU facilities, plus through-about to A3024 Bursledon Road	Option 2	N/A
	Localised widening, signalisation, full NMU facilities, plus through-about to A3025 Hamble Lane	Option 4	N/A
	Localised widening, signalisation, full NMU facilities, plus tunnel to A3024 Bursledon Road	Option 5	N/A
Qualitative Comments **Mostly negligible and minor adverse impacts of a temporary nature are anticipated for all options, primarily on the basis that there are relatively few properties close to either junction. There would, however, be some potential for moderate adverse impacts in the short term at the nearest receptors, for example those in Windmill Lane and West End Road. Options 2, 4 and 5 would**			

[340] Noise Sensitive Receptor
[341] Non-Motorised User

	M27 Junction 8 Options and Descriptions	
	Localised widening, signalisation, full NMU facilities	Dedicated left turn slip lanes on all approaches
necessarily entail more extensive works to construct through-abouts (Options 2 and 4) or the tunnel (Option 5). However, as there are no NSRs that are close to the heart of the junction and on the basis that road traffic will presumably still need to circumnavigate the junction (resulting in a relatively high ambient noise level being generated), this indicates that temporary impacts are still likely to be no higher than moderate adverse at the nearest locations, with negligible and minor adverse impacts elsewhere.		

Table 11-10 Assessment Construction Phase Impacts – Sub-scheme 2

Eastern Access Corridor		
Level 1	**Level 2**	**Level 3**
Reconfiguration of signalling, with existing kerb lines and traffic signal infrastructure to be retained	Introduction of signal control at signalised junctions, with minor changes to kerblines at junctions to improve capacity	As Level 2 but including changes to kerblines and carriageway widening to achieve two lanes per direction along the entire A3024 corridor
Qualitative Comments **For Level 1 only negligible impacts are anticipated as construction works would be limited. For Level 2 the restricted nature of the works would result in mostly negligible and minor adverse impacts, although some localised moderate adverse impacts might be experienced occasionally in the vicinity of some junction improvements works. For Level 3, the proximity of receptors to the line of the A3024 and the works necessary to widen the A3024 corridor, means that moderate and major adverse impacts could be experienced, particularly at NSRs[342] located close to where widening is proposed.**		

Table 11-11 Assessment Construction Phase Impacts – Sub-scheme 3

Bridge Section	Northam Rail Bridge Replacement [1]		
	Option 1	**Option 2**	**Option 3 [2]**
South	Refurbished	Refurbished and raised	New (raised)
North	New (raised)	New (raised)	New (raised)
Notes: 1] The existing bridge does not meet current design standards in terms of headroom beneath. All options except one (the south bridge section under Option 1) would involve raising the bridge to achieve current standards. 2] Under Option 3A, the subway on the eastern side of the bridge is removed and replaced with a surface level crossing, whilst Option 3B retains the subway.			
Qualitative Comments **All options require a new bridge section to be constructed to the north of the existing bridge, with the difference between options principally depending on how the southern bridge section is improved. The need to construct retaining walls and bridge abutments, allied with working over the railway (requiring track possessions, most likely during night time hours) means that for all options major adverse impacts are anticipated at the closest receptors such as those located in Wolverton Road a short distance to the north-east. Moderate and major adverse impacts are also anticipated to the south-west at properties in Northam Road. Properties to the north-east in Radcliffe Road are largely screened by other buildings and oriented in such a way that negligible or minor adverse impacts are more likely at this location.**			

[342] Noise Sensitive Receptor

Table 11-12 Assessment Construction Phase Impacts – Sub-scheme 5

Bitterne Rail Bridge Widening		
Option 1	**Option 2**	**Option 3**
Tidal flow gantry system (no road or bridge widening)	Widening to the north to accommodate two lanes of traffic in each direction	Widening to north to accommodate two lanes of traffic in each direction (replacement of the bridge deck)
Qualitative Comments **The nearest receptors are located within a few metres of the A3024. Therefore, even under Option 1, which would involve fairly limited construction works, minor and occasionally moderate adverse impacts could be experienced in the short term. The more substantial construction works associated with Options 2 and 3 are likely to result in moderate and major adverse impacts, particularly since work over the railway is likely to require track possessions, most likely during night time hours. Properties most likely to be adversely affected are those located on the approaches to the bridge on its southern side.**		

11.7.8 The construction works will be temporary in nature. The proximity of the nearest NSRs and the nature of the construction work mean that there is potential for some moderate and major adverse impacts. This remains the case despite the mitigation measures that would be employed through the preparation and implementation of a CEMP[343], or similar (see **Section 11.6**).

PERMANENT OPERATIONAL IMPACTS

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

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

11.7.10 Should any of these factors vary, whether that is through changes on, or to, an existing road, or as a result of introducing of a completely new section of road, then noise levels are also likely to change. Collectively, these variables might cause noise levels to increase or decrease at any particular receptor.

Qualitative Assessment of Traffic Data

11.7.11 The scheme aims to improve traffic flow and ease severe congestion that affects the eastern access corridor during peak periods.

[343] Construction Environmental Management Plan

11.7.12 Vehicle flow forms the basis of any road traffic noise prediction. With less congestion and an improved flow, traffic might also be attracted to the corridor, rather than discouraged as at present. A higher volume of traffic will generate more noise, all else remaining equal. The relationship is logarithmic, so a doubling of flow is required to generate a 3 dB(A) uplift in noise. A 25% increase (or a 20% decrease) in flow equates to a change of 1 dB(A).

11.7.13 The assessment approach uses a combination of the vehicle speed and the proportion of heavy duty vehicles to form a correction that is applied to the basic noise level derived from the vehicle flow. Above about 40 kph, the higher the speed and the higher the proportion of heavy duty vehicles, the greater the correction will be. This correction can be substantial. For example, with 15% heavy duty vehicles, reducing vehicle speed from 60 kph to 40 kph would result in a 1.2 dB(A) reduction in road traffic noise, all else remaining equal.

11.7.14 At this stage traffic data are not available for specific sub-schemes and so no firm conclusions can be drawn with regard to how changes in traffic flow might influence noise level at sub-scheme level. However, some preliminary traffic data sourced from the SRTM[344] are available for the Do Minimum and three Do Something scenarios identified in **Table 3-1**. These data have been used to generate some basic noise levels (BNLs), as defined in the CRTN, which, in turn, have been used to identify the potential magnitude of impact. These initial predictions are described in the cumulative section below.

Qualitative Assessment of Highway Alterations

11.7.15 The magnitude of noise changes that might be brought about by carriageway realignment depends on the proximity of the nearest NSRs. For example, moving a road source a few metres closer to a receptor will have very little impact where that receptor is over one hundred metres away, but a more notable impact where it is only a few metres away in the first place. The magnitude of impact is determined by the ratio of the two distances, before and after realignment, so the bigger the ratio, the greater the likely change in noise.

11.7.16 **Table 11-13** below provides some qualitative comments on the likely impacts arising from the road realignments for each alternative within each sub-scheme. These comments are not based on any objective, quantitative analysis, but are subjective and based on experience.

Table 11-13 Potential Magnitude of Impact from Highway Realignment

Sub-scheme		Potential Impacts from Realignment
SS1	**M27 Junction 8 / Windhover roundabout**	All options: negligible impacts.
SS2	**Eastern Access Corridor**	Level 1: negligible impacts. Level 2: negligible and minor impacts. Level 3: mostly negligible and minor adverse impacts, but moderate adverse impacts could arise where properties are currently located very close to road and realignments are sizeable (for example properties on the south side of Bursledon Road just to the east of North East Road). Furthermore, a number of properties in Bursledon Road either side of Bath Road are to be demolished. The removal of these properties could result in moderate or major adverse impacts for properties located behind

[344] Sub-Regional Transport Model

Sub-scheme		Potential Impacts from Realignment
		and currently screened from the A3024.
SS3	**Northam Rail Bridge**	All options: minor and moderate adverse impacts especially at properties in Wolverton Road on the north side of the bridge.
SS5	**Bitterne Rail Bridge**	Option 1: negligible impacts. Options 2 and 3: minor adverse impacts, especially at properties on the south side.

11.7.17 On this basis traffic noise levels might be expected to change and possibly by a perceptible amount. Notably, there may be other receptors where traffic noise levels reduce, whether that is through realignment, a change in traffic flow, speed or mix, or because it has been possible to introduce mitigation.

11.7.18 A summary of the potential impacts relating to the sub-scheme options identified in **Table 3-1** is provided in **Table 11-14**.

Table 11-14 Summary of Impacts

Sub - scheme	Alternative	Magnitude of Impact		
		Construction	Operation	
			Traffic Data [1]	Realignments [1]
SS1	Option 1	Mostly negligible and minor adverse with some localised moderate adverse	Traffic data currently unavailable at sub-scheme level. A higher volume of traffic will generate more noise, all else remaining equal. Vehicle speed and mix can also influence noise levels, with a correction being applied to the basic noise level derived from traffic volume. Above about 40 kph the higher the speed and the higher the proportion of heavy duty vehicles, the greater the correction.	Negligible
	Option 2			
	Option 3			
	Option 4			
	Option 5			
SS2	Level 1	Negligible		Negligible
	Level 2	Mostly negligible and minor adverse with some localised moderate adverse		Negligible and minor adverse
	Level 3	Moderate and major adverse at most affected NSRs		Mostly negligible and minor adverse with some localised moderate and even major adverse
SS3	Option 1	Potentially major adverse at most affected NSRs		Minor and moderate adverse
	Option 2			
	Option 3			
SS5	Option 1	Minor and occasionally moderate adverse		Negligible
	Option 2	Moderate and major adverse		Minor adverse
	Option 3			

Note:
1] Ultimately the combined effect will need to be evaluated.

Do Something Scenario Options Impacts

11.7.19 This section considers the potential magnitude of impacts likely to arise from the three scheme Do Something Scenarios Options described in **Table 3-1**.

11.7.20 As noted in **Section 11.7.14** traffic data relating to individual sub-schemes is not available. However, some preliminary data are available for the three Do Something scenarios described in **Table 3-1** as well as the Do Minimum.

11.7.21 A summary of the potential impacts relating to each Do Something scenario identified in **Table 3-1** is provided in **Table 11-18**, following a summary of the BNLs[345] calculated using available traffic data.

Quantitative Analysis of Traffic Data

11.7.22 This section describes an initial analysis of BNLs[346] using traffic data generated from the SRTM[347] for the three Do Something scenarios described in **Table 3-1.**

11.7.23 Vehicle flow forms the basis of the BNL, with vehicle speed and proportion of heavy duty vehicles combining to form a correction that is applied to the BNL. Other factors that influence the BNL are road gradient and road surface.

11.7.24 The aim of this exercise is to gain some understanding of the potential magnitude of impacts likely to be brought about by changes in vehicle flow, speed and mix.

11.7.25 The BNL analysis is not receptor specific, but instead seeks to identify the magnitude of impact on a link-by-link basis; a detailed noise model would be required to determine the cumulative impact of noise arising from a number of road links and at various receptors. Nevertheless, the analysis does provide some indication as to the likely range and extent of noise changes in the immediate vicinity of the scheme and also across the wider highway network.

Basic Noise Level (BNL) Calculations

11.7.26 Initially traffic data were collated for over 250 sections of road in the Southampton area. Consideration was initially given to the likely impacts from traffic travelling in a single direction. Hence, for a typical road carrying two-way traffic, two calculations were initially performed – one for each direction of traffic. Subsequently, consideration has also been given to the likely noise changes based on two-way traffic, by combining, where appropriate, traffic data from both carriageways.

11.7.27 The traffic data utilised in the assessment are described as follows:

→ 18-hour (06:00-24:00 hours) annual average weekday traffic (AAWT) flows[348];

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[345] Basic Noise Levels
[346] Basic Noise Levels
[347] Sub-Regional Transport Model
[348] Peak hour data were also available, but for this PCF Stage 1 Environmental Study Report it is considered appropriate to consider the 18-hour flow, given the emphasis DMRB HD213/11 places on the18-hour rather than peak hour periods.

- the percentage of heavy vehicles. The DMRB[349] advises that a heavy vehicle should have an unladen weight in excess of 3.5 tonnes to be classified as a heavy vehicle for the purposes of the BNL calculations; and
- the average vehicle speed in kilometres per hour.

11.7.28 The raw data have been manipulated as follows:

- links with flows of less than 1,000 vehicles per 18-hour day have been discarded in line with the advice contained in the CRTN;
- links with flows of between 1,000 and 4,000 have had a low-flow correction applied based on a notional distance of 10m from kerb and a receptor height of 1.5m in line with the advice contained in the CRTN; and
- speeds of less than 20 kph have been set at 20 kph in line with the advice contained in Annex 4 of DMRB[350] HD213/11.

11.7.29 Other assumptions are:

- the gradient on each link is unchanged between scenarios; and
- the road surface is unchanged between scenarios[351].

Determining the Change in Noise and Magnitude of Impact

11.7.30 This assessment has utilised the criteria for short-term and long-term noise impacts outlined in Tables 3.1 and 3.2 of DMRB[352] HD213/11, as reproduced in **Tables A-2** and **A-3** in **Appendix C-3**. Based on guidance contained in HD213/11, a change in road traffic noise of 1 dB(A) in the short-term is the smallest considered perceptible. In the long-term, a 3 dB(A) change is considered perceptible.

11.7.31 Traffic data were provided for the following scenarios; those marked by an asterisk have been used in this assessment.

- 2014
- 2019 without scheme *(Do Minimum)*
- 2019 with scheme *(Do Something)*
- 2036 without scheme (Do Minimum)*
- 2036 with scheme *(Do Something)*

11.7.32 Using these data, the following comparisons have been made, based on the DMRB HD213/11 guidance for a simple assessment:

- short term impacts – 2019 (Do Minimum) vs. 2019 (Do Something)*
- long term impacts – 2019 (Do Minimum) vs. 2036 (Do Something)*

[349] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[350] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

[351] In this case a correction of -1 dB has been assumed for all road links regardless of vehicle speed and type of road surface.

[352] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

Results of Analysis

11.7.33 Consideration has been given as to whether the traffic on any link is likely to result in a change in noise level exceeding ±1 dB(A) in the short term when the scheme is opened and/or ±3 dB(A) in the long term.

11.7.34 Whether those links which are anticipated to have BNL[353] changes above these thresholds will result in any particular receptor actually experiencing such a magnitude of change, will depend not just on the change in traffic data for that single link, but also on whether there has been any realignment of the road (or other change that might affect the propagation of noise between road and receiver) and also on the contribution from all other relevant links, whatever the associated BNL change. Nonetheless, in the vicinity of those links where a change in noise above the thresholds is anticipated, it may be concluded that there is a heightened potential for a perceptible change in noise.

Do Something 1

11.7.35 The following points may be concluded from the analysis of one-way traffic on more than 250 links in the Southampton area:

- there are four individual links where the long term change in noise levels is predicted to be higher than +3 dB(A);
- there are sixteen individual links where the short term change in noise levels is predicted to be higher than +1 dB(A), these include the four links with long term changes above +3 dB(A); and
- there are nine individual links where the short term change in noise levels is predicted to be lower than -1 dB(A).

11.7.36 This analysis uses one-way traffic only. Fifteen of the 25 links identified form part of a two-way road. The data for each of these individual links have been combined with data for the matching link carrying traffic in the opposite direction and the results have been re-analysed as summarised in **Table 11-15**.

Table 11-15 Do Something 1 – BNL Analysis

	Short Term BNL Change, dB(A)				Long Term BNL Change, dB(A)			
	1.0 - 2.9	3.0 - 4.9	≥ 5.0	Tot	3.0 - 4.9	5.0 - 9.9	≥ 10.0	Tot
Magnitude	**Minor**	**Moderate**	**Major**		**Minor**	**Moderate**	**Major**	
Increase	9	2	0	11	3	0	0	3
Decrease	6	0	0	6	0	0	0	0
Totals	-	-	-	17	-	-	-	3

11.7.37 More detail is provided in **Appendix C-6** regarding the location of affected road links and magnitude of change, but a brief summary appears below.

[353] Basic Noise Levels

11.7.38 There are ten one-way links associated with four junctions – the Windhover roundabout and Junctions 5, 7 and 8 of the M27. It is considered likely that when the noise contribution from these links is added to that from others nearby, there is unlikely to be a perceptible change in noise levels at the nearest NSRs (based on traffic data alone).

11.7.39 There are seven two-way sections of road all with a predicted BNL[354] change of minor magnitude in the short term – four along the A3024 with noise increases and three along the A335 with noise decreases. It can be concluded, therefore, that for Do Something scenario 1 there is potential for a perceptible change in noise to arise as a result of changes in traffic flow, speed and mix.

Do Something 2

11.7.40 The following points may be concluded from the analysis of one-way traffic on more than 250 sections of road in the Southampton area:

- there are two individual links where the long term noise change in noise levels is predicted to be higher than +3 dB(A); and
- there are six individual links where the short term change in noise levels is predicted to be higher than +1 dB(A), these include the two links with long term changes above +3 dB(A); and
- there are three individual links where the short term change in noise levels is predicted to be lower than -1 dB(A).

11.7.41 This analysis uses one-way traffic only. One of the nine links identified forms part of a two-way road. The data for this individual link has been combined with data for the matching link carrying traffic in the opposite direction and the results have been re-analysed as summarised in **Table 11-16**.

Table 11-16 Do Something 2 – BNL Analysis

	Short Term BNL Change, dB(A)				Long Term BNL Change, dB (A)			
	1.0 - 2.9	3.0 - 4.9	≥ 5.0	Tot	3.0 - 4.9	5.0 - 9.9	≥ 10.0	Tot
Magnitude	**Minor**	**Moderate**	**Major**		**Minor**	**Moderate**	**Major**	
Increase	3	2	0	5	2	0	0	2
Decrease	2	1	0	3	0	0	0	0
Totals	-	-	-	8	-	-	-	2

11.7.42 More detail is provided in **Appendix C-7** regarding the location of affected road links and magnitude of change, but a brief summary is provided below.

11.7.43 All eight identified links are one-way and associated with four junctions – the Windhover roundabout and Junctions 5, 7 and 8 of the M27. It is considered likely that when the noise contribution from these links is added to that from others nearby, there is unlikely to be a perceptible change in noise levels at the nearest NSRs (based on traffic data alone).

[354] Basic Noise Levels

Do Something 3

11.7.44 The BNL[355] analysis for Do Something 3 returns an almost identical set of results to Do Something 2 as summarised in **Table 11-17** and **Appendix C-8**.

Table 11-17 Do Something 3 – BNL Analysis

	Short Term BNL Change, dB(A)				Long Term BNL Change, dB (A)			
	1.0 - 2.9	3.0 - 4.9	≥ 5.0	Tot	3.0 - 4.9	5.0 - 9.9	≥ 10.0	Tot
Magnitude	**Minor**	**Moderate**	**Major**		**Minor**	**Moderate**	**Major**	
Increase	3	2	0	5	2	0	0	2
Decrease	2	1	0	3	0	0	0	0
Totals	-	-	-	8	-	-	-	2

11.7.45 All eight identified links are one-way and associated with four junctions – the Windhover roundabout and Junctions 5, 7 and 8 of the M27. It is considered likely that when the noise contribution from these links is added to that from others nearby, the overall effect at the nearest NSRs would be for there to be no change above the thresholds based on traffic data alone.

SUMMARY

11.7.46 Some adverse impacts during the construction phase are inevitable, but they will be temporary and subject to best practice mitigation measures. Operationally, some of the options and alternatives (either individually or in combination) have the potential to generate changes in noise in excess of 1 dB(A) in the short term and 3 dB(A) in the long term at nearby NSRs. Furthermore, the likely lack of appropriate mitigation measures and the presence of multiple NIAs, means that any adverse impacts cannot be discounted at this stage and will require further detailed assessment and consideration as the scheme design develops.

11.7.47 A summary of the potential impacts relating to the sub-scheme options identified in **Table 3-1** for each Do Something scenario is provided in **Table 11-18.**

Table 11-18 Summary of Impacts

Do Something Scenario	Sub Scheme	Option	Magnitude of Impact		
				Operation	
			Construction	Realignments [1]	Traffic Data [1]
DS 1	SS1	Option 1	Mostly negligible and minor adverse with some moderate adverse	Negligible	Minor to moderate adverse
	SS2	Level 3	Moderate and major adverse	Potentially major at worst	
	SS3	Option 3A	Major adverse	Minor and moderate adverse	
	SS5	Option 1	Minor adverse and	Negligible	

[355] Basic Noise Levels

Do Something Scenario	Sub Scheme	Option	Magnitude of Impact		
			Construction	Operation	
				Realignments [1]	Traffic Data [1]
			occasionally moderate adverse		
DS 2	SS1	Option 1	Mostly negligible and minor adverse with some moderate adverse	Negligible	Negligible to minor adverse
	SS2	Level 1	Negligible	Negligible	
	SS3	Option 3A	Major adverse	Minor and moderate adverse	
	SS5	Option 1	Minor adverse and occasionally moderate adverse	Negligible	
DS 3	SS1	Option 1	Mostly negligible and minor adverse with some moderate adverse	Negligible	Negligible to minor adverse
	SS2	-			
	SS3	-			
	SS5	-			

Note:
1] These impacts have been considered individually, but ultimately the combined effect will need to be evaluated.

11.7.48 Given the close proximity of the nearest NSRs and because some of the construction works are likely to involve substantial items of plant, the potential for some moderate and major adverse impacts cannot be discounted, even accounting for the mitigation measures that would be employed through the preparation and implementation of a CEMP[356] (see **Section 11.6**). It is noted however, that construction works would be temporary in nature.

11.7.49 With regard to operational noise, since traffic data are at this stage unavailable for specific sub-schemes, no firm conclusions can be drawn with regard to how changes in traffic flow might influence noise level at sub-scheme level. However, a qualitative assessment has identified that traffic noise levels during operation might be expected to change and possibly by a perceptible amount at receptors most affected by highway realignments.

11.7.50 With regard to the operational road traffic noise for the three cumulative Do Something scenarios, a preliminary analysis based on BNL[357] predictions has identified that Do Something scenario 1, involving the more extensive interventions, could give rise to a magnitude of impact described as minor to moderate adverse. On the other hand, Do Something scenarios 2 and 3, involving smaller interventions, could give rise negligible to minor adverse impacts.

[356] Construction Environmental Management Plan
[357] Basic Noise Levels

11.7.51 It is generally accepted that in the short-term a change of less than 1 dB(A) is negligible and therefore inconsequential. However, there are a number of NIAs in the area. NIAs have been identified by Defra[358] as part of the European Directive relating to noise mapping and action planning. These are particular 'noise hot spots' and so it is presumed that the Government's noise policy aims[359] would be particularly relevant to such areas and potentially even where negligible impacts are anticipated. This will be a challenge for this scheme since commonly adopted mitigation measures (low noise surface, realignment and noise barriers) may be constrained.

11.8 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

11.8.1 The quantitative analysis of traffic data in this ESR[360] is based on:

- → preliminary data from the SRTM[361] – further traffic data (more detailed and for a wider number of scenarios) will be available as the scheme design develops; and
- → flow, speed and proportion of heavy vehicles and not on other factors such cumulative impacts or changes in propagation.

11.8.2 The general lack of information has dictated that only a broad and predominantly qualitative assessment could be undertaken at this stage. In due course, when detailed road traffic data are available, alignments are refined and options discarded, a proportionate assessment of temporary and permanent noise and vibration effects would be undertaken following the guidance contained in the DMRB[362], WebTAG and Noise Insulation Regulations 1975.

[358] Department for Environment, Food and Rural Affairs
[359] The stated noise policy aims in the Noise Policy Statement for England (2010) are to (a) avoid significant adverse impacts on health and quality of life; (b) mitigate and minimise adverse impacts on health and quality of life; and (c) where possible, contribute to the improvement of health and quality of life.
[360] Environmental Study Report
[361] Sub-Regional Transport Model
[362] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

12 PEOPLES AND COMMUNITIES

12.1 INTRODUCTION

12.1.1 This assessment follows the DMRB[363] interim guidance contained within IAN 125/15[364], combining published guidance in DMRB Volume 11, Section 3, Parts 6 (Land Use), 8 (Pedestrians, Cyclists, Equestrians and Community Effects) and 9 (Vehicle Travellers) into one assessment of 'People and Communities'.

12.1.2 The assessment considers any impacts that the sub-scheme options, as described in **Section 3**, may have on:

- All Travellers: Motorised Travellers (MT) (drivers and passengers of both public and private vehicles) and NMUs (pedestrians, cyclists and equestrians), including amenity and journey length;
- Communities: including development land, agricultural land, private and community land, community severance, tourism and recreation, and housing; and
- People: including the local economy, employment, health and social profiles.

12.1.3 The ESR[365] provides a high level assessment of the potential for the sub-scheme options to affect existing travel patterns, journey lengths and community effects within the study area. Road safety has also been considered, together with effects on severance at the local level.

12.2 ASSESSMENT METHODOLOGY

EFFECTS ON ALL TRAVELLERS

MOTORISED TRAVELLERS: VIEW FROM THE ROAD

12.2.1 The DMRB Volume 11, Section 3, Part 9, Paragraph 2.4 describes 'Views from the Road' as: "…the extent to which travellers, including drivers are exposed to the different types of scenery through which a route passes." Considerations should include:

- The types of scenery or the landscape character as described and assessed for the baseline studies;
- The extent to which travellers may be able to view the scene;
- The quality of the landscape as assessed for the baseline studies; and
- Features of particular interest or prominence in the view.

12.2.2 The sensitivity of views from the road and the magnitude of impact on views from the road has been assessed using the criteria in DMRB Volume 11, Section 3, Part 9.

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[363] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[364] Interim Advice Note (IAN) 125/15; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm
[365] Environmental Study Report

MOTORISED TRAVELLERS: DRIVER STRESS

12.2.3 Driver Stress is defined in Volume 11 of the DMRB[366] as the adverse mental and psychological effects experienced by a driver traversing a road network. There are three main components of driver stress as follows:

- Driver frustration – Caused by an inability to drive at a speed consistent with the standard of the road, which increases as speed falls in relation to expectations;
- Driver fear – The main factors are the presence of other vehicles, inadequate sight distances and the likelihood of pedestrians, particularly children, stepping into the road. Fear is highest when speeds, flows and the proportion of heavy vehicles are all high, becoming more important in adverse weather conditions;
- Driver uncertainty – caused primarily by signing that is inadequate for the individual's purposes.

12.2.4 Level of Driver Stress has been assessed qualitatively, as no detailed traffic modelling has been undertaken at PCF Stage 1. The assessment uses a three point descriptive scale, as recommended in DMRB guidance, as Low, Moderate or High.

NON-MOTORISED USERS

12.2.5 The proposed methodology is based on the procedures set out in the DMRB Volume 11, Section 3, Parts 8 and 9 and the application of DMRB Volume 5, Section 2, Part 5, HD42/05 and will consider:

- The option's impact on the journeys that NMU[367] make in its locality;
- The impact on existing usage of the community facilities and routes by pedestrians and others;
- Changes in safety and amenity value of routes which may be affected by the proposed option;
- The effects of the scheme options on journey length.

12.2.6 The assessment involved a desk study to identify likely NMU activity and how local community facilities are likely to be affected by the construction and operation of the scheme options. This includes both adverse and beneficial effects.

12.2.7 The level of new severance has taken into account criteria set out by DMRB Volume 11, Section 3, Part 8, which categorises the level of impact on journey length, using a three point scale of slight, moderate and severe.

EFFECTS ON COMMUNITIES AND PEOPLE

12.2.8 A qualitative assessment based on professional judgement has been carried out in the absence of specific guidance on both the potential effects on both communities and people. Desk-based research was carried out and included a review of publicly available data.

[366] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[367] Non-Motorised User

12.3 STUDY AREA

EFFECTS ON ALL TRAVELLERS

12.3.1 The study areas for the assessment of the effects on all travellers are as follows:

- Motorised Travellers - The study area for both views from the road and driver stress is along the extent of the scheme, from the A3024 corridor extending from the A27 Windhover roundabout in the west to just east of the Six Dials junction in Southampton, and Junction 8 of the M27, in accordance with DMRB[368] Volume 11, Section 3, Part 9.
- Non-Motorised Users - The study area for the assessment of impact on NMU[369] includes those Public Rights of Way (PRoWs) and NMU routes directly affected by the route options, and any feeder PRoWs.

12.3.2 Sub-scheme design drawings are included in **Appendix A**.

EFFECTS ON COMMUNITIES

12.3.3 The study areas for the assessment of effects on communities are as follows:

- Community Severance - The study area for 'community severance' was extended to include communities that may potentially be directly affected by the scheme, for example, through severance.
- Tourism and Recreation - The study area for tourism and recreation facilities includes any facilities accessed directly from the A3024 corridor from the A27 Windhover roundabout in the west to just east of the Six Dials junction in Southampton and its feeder roads, to enable direct impacts through land take and indirect impacts from access and amenity to be considered.
- Housing – This considers housing within the administrative boundary of SCC[370], as set out in the Adopted Core Strategy[371], and identifies those which could be directly impacted or indirectly impacted because of access or amenity.
- Private Assets and Demolition of Private Property - The study area for 'private assets' consists of the land parcels required to accommodate the proposed development. Private Property is land outside the existing highways boundary that does not accommodate public open space or any other community facility or asset. It can be residential or commercial/industrial land, in accordance with DMRB Volume 11, Section 3, Part 6.2.
- Community Land - Community land is any area of public open space and other facilities such as schools, hospitals, libraries and recreation facilities relied upon for community health and well-being. The study area for 'community land' consists of the land parcels required to accommodate the proposed development, in accordance with DMRB Volume 11, Section 3, Part 6.4.
- Development Land - Development land is land designated within the development plan for particular development purposes, or for which planning permission has been granted or is pending. The study area for 'development land' consists of the land parcels required to

[368] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[369] Non-Motorised User
[370] Southampton City Council
[371] Southampton Local Plan: [online] available at: http://www.southampton.gov.uk/planning/planning-policy/adopted-plans/default.aspx

accommodate the proposed development, in accordance with DMRB Volume 11, Section 3, Part 6.5.

- Agricultural Land - The study area for 'agricultural land' consists of the agricultural land parcels required to accommodate the proposed development, in accordance with DMRB Volume 11, Section 3, Part 6.7.

EFFECTS ON PEOPLE

12.3.4 The approach and study areas for the assessment of effect on people are as follows:

- Local Economy - Publicly available data has been gathered for the relevant Lower Super Output Areas for which data sets are available and publicly available information maintained by the Office of National Statistics (ONS).
- Social Profile - Publicly available data has been gathered for the administrative area of Southampton City Council, and according to the data sets within Arun District Council's Equalities Impact Assessment.
- Health Profile - Publicly available data has been gathered for the administrative area of Southampton City Council, according to the data sets within the published Public Health England Health Profile and available ONS data sets (2011 census).

12.4 BASELINE CONDITIONS

EFFECTS ON ALL TRAVELLERS

MOTORISED TRAVELLERS: VIEWS FROM THE ROAD

12.4.1 From the east to the west of the existing A3024, the current views from the road are as follows:

- Sub Scheme 1:
  - There is no view offered between Junction 8 of the M27 and the Windhover Roundabout due to dense vegetation on both sides.
- Sub Scheme 2 (containing Sub-scheme 3 and Sub-scheme 5 elements):
  - On exiting the Windhover roundabout, the views to the south are enclosed by vegetation (no view) and there are open views of the adjacent fields to the north;
  - Continuing on the Bursledon Road, the views are restricted on both sides by bordering vegetation;
  - On approaching the junction with Botley Road, vegetation on either side of the carriageway becomes denser so that there is no view;
  - Subsequent to the junction with Botley Road, the vegetation remains dense on the north side of the carriageway and offers no views. Residential properties line the southern side of the carriageway, resulting in a restricted view. Views remain at best restricted until reaching Mobray King Way;
  - On reaching Mobray King Way, cuttings and dense vegetation reduce the view further to no view;
  - There remains no view on the Bitterne Road, due to bordering residential properties;
  - Over the Northam Road Bridge, views are open on both sides, extending over the River Itchen; and
  - Once crossing over the river on Northam Road, views are again reduced to a mixture of restricted and no view.

MOTORISED TRAVELLERS: DRIVER STRESS

12.4.2 The following baseline information relates to all Sub-schemes.

12.4.3 Road safety within Southampton has been steadily improving since 2000. However, casualties are still seen at hot spots and bottlenecks. Although not identified as a road safety 'hot spot' by the Southampton's Local Transport Plan, it is likely that the A3024 still causes increased driver fear levels through the combination of the presence of pedestrians routes, and variation of speeds.

12.4.4 There are a number of PRoW[372] on, under and over the sub-scheme options via the footpaths, subways and footbridges. This means that pedestrians are near to, crossing on, or over, the existing roads which has the potential to create MT fear while using the highway.

12.4.5 Bottlenecks along the A3024 at key junctions and restricted road bridges cause delays to MTs and increase frustration to users.

12.4.6 Although it is not possible to assess route uncertainty, it is thought due to the level of fear and frustration experienced by MTs, that the level of Driver Stress experienced is high.

NON-MOTORISED USERS: AMENITY AND JOURNEY LENGTH

Sub Scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades

12.4.7 There are no footways or PRoWs between M27 Junction 8 and the Windhover roundabout.

12.4.8 There are existing footpaths on the roadside for the A27 exit and approach to the Windhover roundabout, both north and south, connected by a path on the central reservation. There are no dedicated traffic control measures for pedestrians at these crossings.

Sub Scheme 2: A3024 Eastern Access Corridor

12.4.9 There are pavements along the length of the A3024 for pedestrian users. On the Burlesdon Road, there is also an off road, shared cyclepath with the pedestrian walk way, until the junction with Botley Road.

12.4.10 There are several paths accessed from the A3024 which are displayed as "Routes for Research" on the Southampton Council Interactive PRoW map[373]:

- → Two paths are accessed from Scholing Common, west of the school;
- → Two paths are accessed from the Muddy Bottom allotments; and
- → Two paths on the land adjacent to Summers Street, south of the River Itchen.

12.4.11 A footpath identified on the Interactive PRoW map is accessed from the western side of Northam Road, immediately south of Northam Rail Bridge.

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[372] Public Rights of Way
[373] Southampton Council Interactive PRoW map; [online] available at https://www.southampton.gov.uk/roads-parking/roads/rights-way-map.aspx

12.4.12 The Itchen Way long distance path is approximately 45 km in length, following the River Itchen from its source to Southampton Water. The Itchen Way path crosses the A3024 at Quayside Road and turns off at Bitterne Road West.

Sub Scheme 3: Northam Rail Bridge Replacement

12.4.13 There are pavements on either side of the relevant section of the Northam Road, on the A3024. There is also a foot bridge over the railway which connects to the south east side of Northam Rail Bridge from Melbourne Street. A shared cycleway and footpath crosses under Northam Rail Bridge, accessible by the footbridge. There is also a pedestrian link from Northam Road to Northumberland Road and Derby Road.

12.4.14 There are no designated PRoW[374] crossing or accessed from this section of the A3024.

Sub Scheme 5: Bittern Bridge Widening

12.4.15 There are pavements on either side of the relevant section of the A3024, which form part of the Itchen Way.

There are no other PRoW crossing or accessed from this section of the A3024.

EFFECTS ON COMMUNITIES

COMMUNITY SEVERANCE

12.4.16 Community severance is defined as the separation of residents from facilities and services that they use within their community, in this case as a result of the scheme.

12.4.17 As the sub-scheme options are to be largely online, with no new roads to be built, it is not considered that there will be any new severance between communities, and this will therefore not be considered any further. Any impacts caused by temporary disruption to NMUs or regarding NMU[375] access will be covered under NMU Amenity and Journey Length.

TOURISM AND RECREATION

12.4.18 There are a number of tourist and recreational facilities located within Southampton which can be accessed either directly from the A3024 or its feeder roads, including:

- Sub Scheme 1:
  - Bursledon Windmill museum and nature reserve is located east of Windhover Roundabout and accessed from the A27 southbound;
- Sub Scheme 2 (including Sub-scheme 3 and Sub-scheme 5 elements):
  - Bursledon Car Boot, accessed from Burlesdon Road;
  - Coalporters Rowing Club is accessed from Northam Road, south of Northam River Bridge;
  - St Mary's Football Stadium (immediately south of Sub-scheme 5) is accessed from the B3038; and

[374] Public Rights of Way
[375] Non-Motorised User

- A number of recreational businesses operate from Shamrock Quay, accessed from the A3024 from Princes Street.

HOUSING

12.4.19 Under Policy CS 4 of the Adopted Core Strategy[376], an additional 16,300 homes will be provided within the City of Southampton between 2006 and 2026. 2,150 homes have been completed between 2006/7 and 2007/8. The pattern of future delivery is expected to be (approximately) as follows:

- 10,150 completions on allocated and identified sites between April 2009 and March 2019 (the ten year supply). These delivery levels do not include windfall sites.
- 3,150 completions between 2019/20 and 2025/26.

12.4.20 The following sites, which border or are directly accessed from the A3024, are allocated for housing under the Adopted Local Plan[377]:

- Land surrounding Lumpy Lane;
- Land adjacent to Parsonage Road;
- Quayside Road scrapyard site;
- Land accessed by Hawkeswood Road;
- 71 Bitterne Road West;
- Land adjacent to Rampart Road; and
- Land adjacent to Bitterne Road East.

PRIVATE ASSETS AND DEMOLITION OF PRIVATE PROPERTY

Sub Scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades

12.4.21 There is no private property which would need to be demolished for any of the options under Sub Scheme 1. All works proposed for all options will be within the highway boundary.

Sub Scheme 2: A3024 Eastern Access Corridor

12.4.22 Where widening is required outside of the highway boundary, there will be loss of private land, the majority of which will be partial loss of gardens. In addition, ten properties (all residential) east of Bath Road, on the northern side of Burlesdon Road, and six properties (all residential and one with commercial premises) on the west of Bath will need to be demolished to accommodate the works. Confirmation will be sought at PCF Stage 2 as to whether any residential properties comprise assisted living accommodation.

Sub Scheme 3: Northam Rail Bridge Replacement

12.4.23 There is no private land required to accommodate the works for Sub-scheme 3.

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[376] Southampton Core Strategy (2015): [online] available at https://www.southampton.gov.uk/policies/Amended-Core-Strategy-inc-CSPR-%20Final-13-03-2015_tcm63-371354.pdf

[377] Southampton Adopyed Local Plan map: [online] available at: https://www.southampton.gov.uk/planning/planning-policy/adopted-plans/local-plan-adopted-map.aspx

Sub Scheme 5: Bittern Bridge Widening

12.4.24 There may be some private land outside of the highway boundary required to accommodate the works for Sub-scheme 5. However, it is likely that this will be limited to vegetated land and no demolitions will be required.

COMMUNITY LAND

12.4.25 Scholing Common (also known as Donkey Common), adjacent to the north of Burlesdon Road, is registered as Common Land under the CRoW Act 2000.

12.4.26 Allotments are located adjacent either side of Burlesdon Road at Muddy Bottom and Bitterne Road West[378].

12.4.27 There are a number of areas of public open space as listed by SCC's online Interactive Map[379], including:

- Netley Common, adjacent to Windhover Roundabout and the A3024;
- Eastpoint, adjacent north of Burlesdon Road;
- Shoreburs Greenway, adjacent south of Burlesdon Road;
- Hum Hole Park, adjacent north of Maybray King Way; and
- Bitterne Manor Open Space adjacent north of Bitterne Road West

DEVELOPMENT LAND

12.4.28 There are no Major Development Zones, as defined by the Adopted Local Plan, which are within the land take required for any of the options. As such, development land will not be considered further within this assessment.

AGRICULTURAL LAND

12.4.29 Agricultural land has been classified by the Ministry for Agriculture, Fisheries and Food (MAFF), now Defra[380], by grade land according to the extent to which chemical and physical characteristics impose long term limitations on agricultural use for food production.

12.4.30 There is no agricultural land within the footprint of the sun-scheme options and therefore this will not be considered further.

EFFECTS ON PEOPLE

LOCAL ECONOMY

Deprivation

[378] SCC's online Interactive Map [online] available at http://www.southampton.gov.uk/WhereILive/MapSouthampton.aspx
[379] SCC's online Interactive Map [online] available at http://www.southampton.gov.uk/WhereILive/MapSouthampton.aspx
[380] Department for Environment, Food and Rural Affairs

12.4.31 The Indices of Multiple Deprivation use a combination of information relating to income, employment, education, health, skills and training, barriers to housing and services and crime to create an overall score of deprivation. As a lower score indicates greater deprivation, the most deprived area is indicated by a rank of 1. The scores of the relevant Lower-layer Super Output Areas (LSOAs) which are affected by the sub-scheme options are detailed below. The scores for all LSOA in the district provide an average for which the district is given a rank.

12.4.32 Southampton is ranked 81st most deprived authority out of 326 Local Authorities in England[381].

- → 23% of the city's population lives in the most deprived LSOAs[382] in England.
- → Between 2007 and 2010, 63% of the Lower Super Output Areas have not moved between deciles whilst 16% have become less deprived and 23% more deprived.

12.4.33 The overall most deprived areas based on the IMD 2010 are in Bevois, Redbridge, Millbrook, Woolston (Weston) and Bitterne (Thornhill) wards. This is unchanged from 2007.

Employment

12.4.34 Employment statistics[383] for the City of Southampton show that the numbers of economically active employed is lower than the regional and national average, as shown in **Table 12-1**. The number of economically inactive residents is higher than both the national average and the regional average.

Table 12-1 Employment Statistics for Southampton, South East and England

	Southampton	South East	England
Residents aged 16-74	180,201	6,274,341	38,881,374
Economically Active	103,902 (57.7%)	4,095,333 (65.2%)	24,143,464 (62.1%)
Economically Active - Unemployed	7,631 (4.2%)	216,231 (3.4%)	1,702,847 (4.4%)
Economically Inactive	64,491 (35.8%)	1,968,052 (31.3%)	13,430,386 (34.5%)

12.4.35 The key industries of the area are wholesale and retail trade (17.4%), human health and social work (13.4%), education (10.3%), manufacture (8.5%), and construction (7.9%)[384].

[381] Southampton City Council (2013) Equalities Profile for Southampton
[382] Lower-layer Super Output Area
[383] Office for National Statistics, Census 2011
[384] Office for National Statistics, Census 2011

12.4.36 The average annual income of resident workers in Southampton was £23,998 in 2011. This is 86% of the average annual income of the Southampton workforce, £27,909 for the same year – representing a pay gap of 16.3%. The ONS Annual Survey of Hours and Earning also shows that the median hourly rate for full time workers is £11.47 compared to £14.13 for the South East and £12.77 for Great Britain. Although there is a difference between the male and female hourly rate, £11.71 compared to £10.76, the difference is less than for the South East (£15.26 for men and £12.66 for women) and Great Britain (£13.32 and £11.95)[385].

12.4.37 There are several safeguarded employment and industrial sites adjacent to the A3024, including:

- Northam Industrial Estate, safeguarded under Policy AP3 of the City Centre Action Plan[386];
- Centurion Industrial park, safeguarded under Policy REI10 Industry and Warehousing of the Amended Local Plan Review[387]; and
- Quayside Road Industrial Park, safeguarded under REI11 of the Amended Local Plan Review.

SOCIAL PROFILE

12.4.38 The following statistics detail the age and sex profile[388] (**Table 12-2**), religion (**Table 12-3**) and ethnicity[389] (**Table 12-4)**.

Table 12-2 2012 Mid Year Population Estimates for Southampton

Age	Male	Female
0-14	20,300	19,200
15-24	25,100	23,100
25-44	36,700	33,700
45-64	25,100	24,500
65+	14,000	17,800
Total	121,200	118,300

[385] Southampton City Council (2013) Equalities Profile for Southampton
[386] City Centre Action Plan: [online] available at http://www.southampton.gov.uk/Images/CCAP-18-March-2015_tcm63-371356.pdf
[387] City Centre Action Plan: [online] available at http://www.southampton.gov.uk/policies/Amended-LPR-with-CCAP-and-CS-changes-13-03-2015_tcm63-371355.pdf
[388] Southampton City Council (2013) Equalities Profile for Southampton
[389] Office for National Statistics, Census 2011

Table 12-3 Religious followers in Southampton, the South East and England from 2011 Census

Religion	Southampton	South East	England
Christian	122018	5160128	31479876
Buddhist	1331	43946	238626
Hindu	2482	92499	806199
Jewish	254	17761	261282
Muslim	9903	201651	2660116
Sikh	3476	54941	420196
Other Religion	1329	39672	227825
No Religion	79379	2388286	13114232
Religion Not Stated	16710	635866	3804104

Table 12-4 Ethnicity for Southampton, the South East and England as recorded in 2011 Census

Ethnicity	Southampton	South East	England
White; English/Welsh/Scottish/Northern Irish/British	183980	7358998	42279236
White; Irish	1746	73571	517001
White; Gypsy or Irish Traveller	341	14542	54895
White; Other White	17461	380709	2430010
Mixed/Multiple Ethnic Groups; White and Black Caribbean	1678	45980	415616
Mixed/Multiple Ethnic Groups; White and Black African	941	22825	161550
Mixed/Multiple Ethnic Groups; White and Asian	1796	58764	332708
Mixed/Multiple Ethnic Groups; Other Mixed	1263	40195	283005
Asian/Asian British; Indian	6742	152132	1395702
Asian/Asian British; Pakistani	3019	99246	1112282
Asian/Asian British; Bangladeshi	1401	27951	436514
Asian/Asian British; Chinese	3449	53061	379503
Asian/Asian British; Other Asian	5281	119652	819402
Black/African/Caribbean/Black British; African	3508	87345	977741
Black/African/Caribbean/Black British; Caribbean	1132	34225	591016
Black/African/Caribbean/Black British; Other Black	427	14443	277857
Other Ethnic Group; Arab	1312	19363	220985
Other Ethnic Group; Any Other Ethnic Group	1405	31748	327433

12.4.39 According to the SCC Equalities Profile[390], the following conclusions were drawn about the social profile of residents within the area:

→ According to the Census 2011, the residential population of Southampton was recorded as 236,900. This is an increase of 19,500 or 8.9% on the 2001 census population of 217,400. In

[390] Southampton City Council (2013) Equalities Profile for Southampton

England the population increased by 12.7%. The population of Southampton is predicted to grow by 7% by 2021.

- The 2011 Census recorded the following statistics about residents ethnicity:
  - The White British population of Southampton has fallen by 4.7% (-8,990) from 192,970 (88.74%) in to 2001 to 183,980 (77.7%) in 2011.
  - The other White population, which includes migrants from Europe, has increased in the last ten years by over 212% from 5,519 to 17,461 or 7.4% of the population.
  - The Indian population is 2.8% and the Asian or British Asians form 8.4% of the whole population.
- 7,522, or 7.7%, of households in Southampton have no people in them who have English as a main language.
- The city has high levels of child poverty. According to HMRC data (2010) 26.1% of the city's children living in poverty. In some wards of the city this figure is as high as 40%. This compares to an average of 20.6% in England and 15% for the South East. In Southampton, 80% of children in poverty in the city are in households claiming Jobseekers Allowance or Income Support.
- There are 3,863 households in the city, defined as 'deprived, very elderly, mainly single pensioners living in council owned, purpose built accommodation'. A higher proportion of older people in Southampton rely upon input from social services than the national average (5.2% compared to 3.8% nationally). There is a forecast increase of 15% in the number of people over 85 from 5,200-6,000 and a rise in the number of people with dementia related conditions, of whom two thirds live in the community and one third live in care homes.

HEALTH PROFILE

12.4.40 The state of health of all residents in Southampton, the South East and England as recorded within the 2011 census[391] is shown in **Table 12-5**. Southampton is more closely aligned with the recorded percentages in each category, apart from those in fair health, with England as a whole. It has a lower number of people than the South East listed as in very good health, and a higher number of those considering themselves to be in bad and very bad health.

Table 12-5 Health of people in Southampton, the South East and England in 2011

State of Health	Southampton	South East	England
Very Good Health	112,653 (47.56%)	4,232,707 (49.02%)	25,005,712 (47.17%)
Good Health	82,880 (34.99%)	2,989,920 (34.63%)	18,141,457 (34.22%)
Fair Health	29,278 (12.36%)	1,037,592 (12.02%)	6,954,092 (13.12%)
Bad Health	9,223 (3.89%)	291,456 (3.38%)	2,250,446 (4.25%)
Very Bad Health	2,848 (1.2%)	83,075 (0.96%)	660,749 (1.25%)

12.4.41 **Table 12-6** outlines the numbers of people within Southampton, the South East and England who consider their day-today activities to be limited by their health[392].

Table 12-6 Day to day Activity Limits in Southampton, the South East and England in 2011

	Southampton	South East	England
Day-to-Day Activities	18,165 (6.60%)	593,643 (5.94%)	4,405,394 (7.06%)

[391] Office for National Statistics, Census 2011
[392] Office for National Statistics, Census 2011

	Southampton	South East	England
Limited a Lot			
Day-to-Day Activities Limited a Little	20,234 (7.35%)	762,561 (7.63%)	4,947,192 (7.93%)
Day-to-Day Activities Not Limited	198,483 (72.10%)	7,278,546 (72.85%)	43,659,870 (70.01%)

12.4.42 The Health Profile for Southampton in 2015[393], published by Public Health England, summarises that:

- The health of people in Southampton is generally worse than the England average. Deprivation is higher than average and about 23.5% (9,800) children live in poverty. Life expectancy for both men and women is lower than the England average;
- In Year 6, 21.8% (427) of children are classified as obese, worse than the average for England. In 2012, 25.1% of adults are classified as obese;
- Priorities in Southampton include tobacco control, alcohol and drugs, improving outcomes for children and young people and reducing inequalities.

12.4.43 There are 10 AQMA's[394] within Southampton, of which one (AQMA 2 - Bitterne Road West) is located in the location of the Scheme. This is discussed further in **Section 5**.

12.5 REGULATORY AND POLICY FRAMEWORK

NATIONAL

NATIONAL NETWORK NATIONAL POLICY STATEMENT

12.5.1 The NN NPS[395]) identifies the government's objectives for the National Networks, and those relevant to MT and NMU[396] include:

- Support and improve journey quality, reliability and safety;
- Support the delivery of environmental goals and the move to a low carbon economy; and
- Join up our communities and link effectively to each other.

NATIONAL PLANNING POLICY FRAMEWORK

12.5.2 The NPPF sets out a number of 'Core Planning Principles', which are necessary to deliver sustainable development. One of the principles, most relevant to this section, emphasises the need to manage patterns of growth to make the fullest possible use of public transport, walking and cycling.

12.5.3 Section 4 of the NPPF sets out how transport should be considered within the context of planning decisions and sustainable development. The framework states that encouragement should be given to solutions that seek to reduce congestion and serve to facilitate the use of sustainable transport.

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[393] Public Health England (2015) Southampton Health Profile 2015
[394] Air Quality Management Area
[395] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[396] Non-Motorised User

12.5.4 The NPPF also encourages development that exploits opportunities for sustainable transport. Particularly by giving priority to pedestrian and cycle movements, and providing access to high quality public transport facilities. In addition, the NPPF encourages development that minimises conflict between vehicular traffic, cyclists and pedestrians. The scheme aims to alleviate congestion and will include cycle and pedestrian improvements.

12.5.5 The NPPF (section 4 paragraph 31) states that local authorities should "develop strategies for the provision of viable infrastructure necessary to support sustainable development".

THE COUNTRYSIDE AND RIGHTS OF WAY ACT 2000 (CROW ACT)

12.5.6 The CRoW Act regulates all PRoW[397] and ensures access to them. The Act obliges the highway authority to recognise the needs of the mobility impaired when undertaking improvements. The scheme will consider PRoW provision.

THE DISABILITY DISCRIMINATION ACT 1995 (AMENDED IN 2005)

12.5.7 The Act requires Design Organisations to ensure that, where possible, accessibility for disabled people is equal to that of other NMU. Disabled people, defined as those having a range of physical, sensory or mental impairments, represent approximately 14% of the UK's population. The scheme will consider disabled access.

LOCAL

SOUTHAMPTON CITY COUNCIL ADOPTED CORE STRATEGY 2015[398]

12.5.8 Southampton's Local Development Framework (LDF) replaces the Local Plan Review adopted in March 2006 and sets out the planning policies by which Southampton Council wish to see development guided. The following policies in **Table 12-7** are relevant to the People and Communities assessment.

Table 12-7 Relevant planning policies from the Southampton Local Development Framework

Policy Reference	Policy Details
Policy CS 3 – Town, district and local centres, community hubs and community facilities	New development should make a positive contribution to the centre's viability and vitality, promote and enhance its attractiveness, respect where possible the historic street patterns and building lines and improve its connectivity to surrounding residential neighbourhoods.
CS 4 – Housing Delivery	An additional 16,300 homes will be provided within the City of Southampton between 2006 and 2026.
Policy CS 18 – Transport: Reduce – Manage - Invest	To support the regional economy, enhance air quality and achieve a modal shift to more environmentally sustainable transport, a 'reduce-manage-invest' approach will be taken.
Policy CS 21 – Protecting and Enhancing Open Space	The Council will retain the quantity and improve the quality and accessibility of the city's diverse and multi – functional open spaces and help deliver new open space both within and beyond the city to meet the needs of all age groups through: 1. Protecting and enhancing key open spaces including Southampton Common, central, district and local parks; 2. Replacing or reconfiguring other open spaces in order to achieve wider

[397] Public Rights of Way
[398] Southampton Local Plan: [online] available at: http://www.southampton.gov.uk/planning/planning-policy/adopted-plans/default.aspx

Policy Reference	Policy Details
	community benefits such as improving the quality of open space, or providing a more even distribution across the city; 3. Safeguarding and, when opportunities arise, extending the green grid; 4. Seeking developer contributions to provide high quality, accessible open spaces.

LOCAL TRANSPORT PLAN 3: STRATEGY AND IMPLEMENTATION PLAN FOR SOUTHAMPTON

12.5.9 The Local Transport Plan sets out the Council's plan to improve the transport network. The following policies in **Table 12-8** detail those relevant to the People and Communities assessment and outlines measures by which they will be obtained.

Table 12-8 Relevant planning policies from the Southampton Local Transport Plan

Policy Reference	Policy Details
Policy C: To optimise the capacity of the highway network and improve journey time reliability for all modes	The Transport for South Hampshire (TfSH) authorities will work to better manage the existing highway network to ensure that existing capacity is optimised and used efficiently. This policy will maximise the through put of the highway network for all users and modes. This will entail using traffic signal control and other highway technologies, helping to improve network management, and greater priority for buses.
Policy G: To improve road safety across the sub-region	Work to date has been effective at reducing incidences of speeding and unsafe road-user behaviour through education, engineering measures at sites with high casualty records and enforcement of speed limits. Reductions in speed limits and crossing improvements within built up areas have further improved the safety of vulnerable road users
Policy H: To promote active travel modes and develop supporting infrastructure	The TfSH[399] authorities will work with health and activity partners, including public health teams, to develop a network of high-quality, direct, safe routes targeted at pedestrians and cyclists. Well-designed routes and secure cycle parking can be partly delivered through the planning system.

12.6 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

12.6.1 The main aim of the scheme is the alleviation of congestion along the A3024 and M27. The preferred scheme design option is expected to support local growth in housing and employment through the provision of viable alternative access into and out of Southampton.

12.6.2 It is anticipated that as the design progresses in PCF Stage 2 and 3 the assessment will address the potential effects on the amenity of the area arising through any loss of green infrastructure. The Natural Capital concept will be considered at PCF Stage 2 and 3 in order to assess the impact of the loss of ecological features on residential communities.

12.6.3 As part of the more detailed design at PCF Stage 2 and 3, a review will be undertaken to determine how the effects of severance or effects on access would potentially affect other committed developments.

[399] Transport for South Hampshire

EFFECTS ON ALL TRAVELLERS

MOTORISED TRAVELLERS

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

- Where overriding landscape or design constraints do not restrict this, the view from the road for MT will not be further obstructed by new structure(s), and open views of the surrounding countryside should be retained;
- The delays currently experienced by MT using the A3024, and connecting roads are expected to lead to frustration, and will be reduced through the design of the scheme. The best performing options will result in a reduction in Driver Stress associated with delays;
- Signage and layout will be clear to understand and avoid creating Route Uncertainty. Any diversions or closures undertaken during construction should be clearly advertised, and any diversionary routes should not lead to Route Uncertainty;
- The design will include embedded safety measures to reduce Motorist Fear of Accidents with other MTs and NMUs; and
- Best practise landscape management techniques (see **Section 7** of this ESR[400]), as outlined in the DMRB[401], Volume 10, will be embedded in the design to ensure safety whilst respecting the environment.

12.6.5 These measures and design considerations will be addressed at the subsequent phase (PCF Stage 2) of the design.

NON-MOTORISED USERS

12.6.6 The preferred option, once selected, will accommodate NMUs and either retain or improve the existing access arrangements. For example, the existing footpaths will be retained (and enhanced where feasible) and where crossed by the route, provided with proper means of access to prevent severance. Any diversionary works or closure of NMU[402] routes will be undertaken following proper consultation with affected groups or individuals, and the required consent will need to be obtained.

12.6.7 Use of best practice design with regards to the safety of NMU, including lighting, will improve the amenity of users of the footpaths in the surrounding areas. Additionally, landscaping that can provide screening of the road where feasible and reduce noise levels for the wider network of PRoW[403] will also improve amenity for users.

12.6.8 Existing types of access to PRoW will be retained, for example, by not introducing new barriers such as stiles, which may restrict certain users.

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[400] Environmental Study Report
[401] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[402] Non-Motorised User
[403] Public Rights of Way

EFFECTS ON COMMUNITIES

TOURISM AND RECREATION

12.6.9 Use of best practice construction methods during construction will reduce disruption to users of facilities within the vicinity of the scheme. This will include maintaining MT and NMUs access to tourism and recreational facilities throughout the construction period. PRoWs will be diverted and remain open throughout the construction period, where feasible.

HOUSING

12.6.10 Part of the overall aim of the scheme is to promote local growth in housing in Southampton. The preferred design solution will be designed with future development in mind.

PRIVATE ASSETS & DEMOLITION OF PRIVATE PROPERTY

12.6.11 If the chosen Sub-scheme options encroach on private property, resulting in land take, the owners of the property will need to be adequately compensated for the loss of property through the relevant statutory processes. Prior consideration will be made in the design towards the avoidance or minimisation of such land take.

COMMUNITY LAND

12.6.12 As for private assets above, allotment tenants and other community land will need to be adequately compensated for the loss of amenity as a result of any scheme land take. Priority should be given to those displaced on other existing vacant allotment plots. Compensatory land may need to be provided to replace that lost. Prior consideration should be made in the design towards the avoidance or minimisation of community land take.

EFFECTS ON PEOPLE

LOCAL ECONOMY

12.6.13 Where feasible, the workforce and scheme supply chain should be sourced locally. A Transport Management Plan should be implemented to minimise disruption on commercial businesses and commuters.

SOCIAL PROFILE

12.6.14 The design should take account of vulnerable groups such as the disabled, children and elderly people, using measures as detailed above for NMUs[404].

12.6.15 Bus services should be resumed as usual where feasible. Any amendments to bus services should be adequately publicised and replacement services should be provided if necessary.

HEALTH PROFILE

12.6.16 Best practice construction methods will be used to minimise noise and emissions to air during construction.

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[404] Non-Motorised User

12.6.17 PRoW[405] will remain open where feasible and diverted if necessary, instead of closures, to allow active travel and recreational use by residents. Closure and replacement of crossings should be designed with consideration to vulnerable users, and to be suitable to service access to community facilities.

12.7 OVERALL ASSESSMENT

SUB SCHEME 1 - M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

Option 1: Localised Junction Widening

Effects on All Travellers

12.7.1 All construction works will take place within the highways boundary, and therefore there will be no long term operational change to views from the road for MT[406].

12.7.2 Driver Stress may be temporarily increased as a result of construction works and associated traffic issues, but as levels of Driver Stress are already assumed to be high, there will be no change. However, it is expected that this option will improve traffic flows and reduce congestion locally, resulting in a more effective network and an overall decrease in driver stress during operation.

12.7.3 The new and improved proposed NMU facilities for cyclists and pedestrians will improve connectivity and amenity for users during the operational phase, providing a slight beneficial effect. There may be some temporary disruption to NMU journeys and a reduction in amenity during construction, resulting in temporary adverse effects.

Effects on Communities

12.7.4 This option is not expected to sever existing communities. It will not directly affect any tourism or recreational facilities nor adversely affect future housing development. It does not require the demolition of any existing housing. No private assets, community land or development will be directly impacted upon by this option as all improvements will be within the highways boundary.

Effects on People

12.7.5 Construction works will cause a temporary increase in employment and increase of spend in the local economy, resulting in a temporary beneficial effect.

12.7.6 This option will have a slight beneficial effect on MTs commuting and accessing Southampton City Centre. It is not likely that there will be any direct impacts on areas of strategic growth and employment land allocations within Southampton.

12.7.7 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. The Air Quality assessment in **Section 5** indicates that the impact on air quality will be at best neutral and at worst minor adverse. This is likely to result in neutral or adverse health effects.

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[405] Public Rights of Way
[406] Motorised Travellers

Option 2: Through-about to A3024 Bursledon

Effects on All Travellers

12.7.8 Construction works will generally take place within the highways boundary. Therefore it is anticipated that there will be no significant change to views from the road for MT.

12.7.9 Driver Stress may be temporarily increased as a result of construction works and associated traffic issues but as levels of Driver Stress levels are already assumed to be high, there is expected to be no change. However, it is expected that the improvements will improve traffic flows and reduce congestion locally resulting in a more effective network and an overall decrease in driver stress during operation.

12.7.10 The new proposed NMU[407] facilities for cyclists and pedestrians will improve connectivity for users, providing a beneficial impact. There will be an additional road crossing for NMUs over the new section of carriageway across Windhover Roundabout, which will reduce amenity for users, and provide an adverse impact. There may be some temporary disruption to NMU journeys and a reduction in amenity during construction, potentially resulting in temporary moderate adverse impacts.

Effects on Communities

12.7.11 This option is not expected to sever existing communities, directly affect any tourism or recreational facilities, adversely affect future housing development, or require the demolition of any existing housing. No private assets, community land or development will be directly impacted upon by this option as all improvements will be within the highways boundary.

Effects on People

12.7.12 This option will have a slight beneficial effect on MTs commuting and accessing Southampton City Centre. It is not likely that there will be any direct impacts on areas of strategic growth and employment land allocations within Southampton.

12.7.13 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. It is anticipated at this stage that due to the decrease in congestion but likely increase in traffic flows, the impact on air quality (see **Section 5**) will be at best neutral and at worse minor adverse.

Option 3: Free-flow left-turn slip lanes at M27 Junction 8

12.7.14 The impacts upon receptors are considered to be the same as Sub-scheme 1 Option 1.

Option 4: Through-about to A3025 Hamble Lane

12.7.15 The impacts upon receptors are considered to be the same as Sub-scheme 1 Option 2.

Option 5: Tunnel under Windhover Roundabout

12.7.16 This option proposes the same improvements to M27 Junction 8 as Options 1, 2 and 4. The variation to this option is the construction of a tunnel under the Windhover Roundabout to link the A3024 to A3024 Bursledon Road.

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[407] Non-Motorised User

Effects on All Travellers

12.7.17 All construction works will take place within the highways boundary, and therefore there will be no long term operational change to views from the road for MT.

12.7.18 Driver Stress may be temporarily increased as a result of construction works and associated traffic issues but as levels of Driver Stress are already assumed to be high, there will be no change. However, it is expected that the improvements will improve traffic flows and reduce congestion locally resulting in a more effective network and an overall decrease in driver stress during operation.

12.7.19 The new proposed NMU[408] facilities for cyclists and pedestrians at Junction 8 of the M27 will improve connectivity and amenity for users during the operational phase, providing a slight beneficial impact. There may be some temporary disruption to NMU journeys and a reduction in amenity during construction, potentially resulting in temporary moderate adverse impacts.

Effects on Communities

12.7.20 The impacts upon receptors are considered to be the same as Sub-scheme 1 Option 1.

Effects on People

12.7.21 The impacts upon receptors are considered to be the same as Sub-scheme 1 Option 1.

SUB-SCHEME 1 SUMMARY

The effects of Sub-scheme 1 are summarised in **Table 12-9** below.

Table 12-9 Sub-scheme 1 Summary of Effects

Sub-scheme	Options	Impact					
		All Travellers		Communities		People	
		Construction	Operation	Construction	Operation	Construction	Operation
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout Upgrades	Option 1 : Localised Junction Widening	No change to temporary adverse	Slight beneficial	No change	No change	Slight beneficial	Slight beneficial to minor adverse
	Option 2 : Through-about to A3024 Bursledon	No change - moderate adverse	Beneficial to adverse impact	No change	No change	TBA	Slight beneficial to minor adverse
	Option 3 : Free-flow left-turn slip lanes at M27 Junction 8	No change to temporary adverse	Slight beneficial	No change	No change	Slight beneficial	Slight beneficial to minor adverse
	Option 4 : Through-about to A3025 Hamble	No change - moderate adverse	Beneficial to adverse impact	No change	Beneficial to adverse impact	TBA	Slight beneficial to minor adverse

[408] Non-Motorised User

Sub-scheme	Options	Impact					
		All Travellers		Communities		People	
		Construction	Operation	Construction	Operation	Construction	Operation
	Lane						
	Option 5 : Tunnel under Windhover Roundabout	No change to moderate adverse	Slight beneficial impact	No change	No change	Slight beneficial	Slight beneficial to minor adverse

SUB SCHEME 2 – A3024 EASTERN ACCESS CORRIDOR

Level 1: Signal control improvements

Effects on All Travellers

12.7.22 As construction works will take place within the highways boundary there will be no change to views from the road for motorised users.

12.7.23 Driver Stress may be temporarily increased as a result of construction works and associated traffic issues but as levels of Driver Stress are already assumed to be high, there will be no change. However, it is expected that the preferred option will improve traffic flows and reduce congestion locally resulting in a more effective network and an overall decrease in driver stress during operation.

12.7.24 The removal of the existing bus lanes between Windhover Roundabout and Six Dials junction may impact negatively upon the travel times of bus passengers. However, the provision of increased capacity for all modes of transport along the A3024 corridor may result in reduced journey times for bus passengers. The impact of the scheme proposals on bus journey times will be determined at a future stage using detailed traffic modelling tools.

Effects on Communities

12.7.25 This option does not have the potential to sever existing communities, as the A3024 already exists. It will not directly impact upon any tourism or recreational facilities nor adversely affect future housing development, community land, private land or development land.

Effects on People

12.7.26 It is not likely that there will be any direct impacts on areas of strategic growth and employment land allocations within Southampton.

12.7.27 Construction works will cause a temporary increase in employment and increase of spend in the local economy, resulting in a temporary beneficial effect.

12.7.28 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. It is anticipated at this stage that due to the decrease in congestion but likely increase in traffic flows, the impact on air quality may be minor to moderately adverse.

Level 2: Junction and signal improvements

Effects on All Travellers

12.7.29 As construction works will take place within the highways boundary and there will be only minor changes to kerblines within the highway boundary, it is anticipated that the impact upon receptors is the same for SS2 Level 1.

12.7.30 The removal of the existing bus lanes between Windhover Roundabout and Six Dials junction may impact negatively upon the travel times of bus passengers. However, the provision of increased capacity for all modes of transport along the A3024 corridor may result in reduced journey times for bus passengers. The impact of the scheme proposals on bus journey times will be determined at a future stage using detailed traffic modelling tools.

Effects on Communities

12.7.31 As construction works will take place within the highways boundary it is anticipated that the impact upon receptors is the same for Sub-scheme 2 Level 1.

Effects on People

12.7.32 As construction works will take place within the highways boundary it is anticipated that the impact upon receptors is the same for Sub-scheme 2 Level 1.

Level 3: Dualling full A3024 corridor

12.7.33 The carriageway widening, particularly east and west of Northam Rail Bridge, Bath Road junction along A3024 Bursledon Road and at Botley Road, would result in substantial amounts of land take.

Effects on All Travellers

12.7.34 Where construction works will take place within the highways boundary there will be no change to views from the road for motorised users. Where widening is required, existing vegetation may need to be removed. It is likely that views from the road will remain as either no view or restricted due to the location within a developed area and therefore will only be subject to a change of minor significance as a worst case.

12.7.35 Driver Stress may be temporarily increased as a result of construction works and associated traffic issues but as levels of Driver Stress are already assumed to be high, there will be no change. However, it is expected that the preferred option will improve traffic flows and reduce congestion locally resulting in a more effective network and an overall decrease in driver stress during operation.

12.7.36 The provision of new NMU[409] and widening of existing facilities will improve connectivity and amenity for users during the operational phase, providing a slight beneficial effect. However, it is anticipated that due to the increase in the number of lanes and the removal of street furniture and vegetation, there may be some reduction in amenity, causing a slight permanent adverse effect. The widening of NMU facilities will be beneficial for wheelchair users and cyclists.

12.7.37 There may be some temporary disruption to NMU journeys, increasing journey times and a reduction in amenity during construction, resulting in slight temporary adverse effects. Journey lengths may be permanently increased for some NMU during operation, due to the location of new pedestrian crossings and increase in number of lane, but are not anticipated to be more then slightly affected.

12.7.38 The removal of the existing bus lanes between Windhover Roundabout and Six Dials junction may impact negatively upon the travel times of bus passengers. However, the provision of increased capacity for all modes of transport along the A3024 corridor may result in reduced journey times for bus passengers. The impact of the scheme proposals on bus journey times will be determined at a future stage using detailed traffic modelling tools.

Effects on Communities

12.7.39 This option does not have the potential to sever existing communities, as the A3024 already exists. It will not directly impact upon any tourism or recreational facilities nor adversely affect future housing development. There may be some temporary disruption to those accessing tourism and leisure facilities during construction, causing a temporary adverse effect.

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[409] Non-Motorised User

12.7.40 Where widening is required outside of the highway boundary, there will be loss of private land. In addition, ten properties (all residential) east of Bath Road, on the northern side of Burlesdon Road, and six properties (all residential and one with commercial premises) on the west of Bath Road will need to be demolished to accommodate the works, causing a significant adverse effect to residents.

12.7.41 The following community land assets will suffer partial loss of land, causing a permanent adverse effect:

- Open space at Eastpoint; and
- Allotments at Muddy Bottom South;

12.7.42 Widening of the A3024 at Scholing Common will result in partial loss of land and will require that land is deregistered as Common Land under the CRoW Act and replaced with an area of land of equivalent size and quality.

Effects on People

12.7.43 It is not likely that there will be any direct impacts on areas of strategic growth and employment land allocations within Southampton.

12.7.44 Construction works will cause a temporary increase in employment and increase of spend in the local economy, resulting in a temporary beneficial effect.

12.7.45 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. It is anticipated at this stage that due to the decrease in congestion but likely increase in traffic flows, the impact on air quality will be at best neutral and at worse minor adverse.

12.7.46 Provision and improvement of off road NMU[410] facilities is likely to encourage NMU travel modes for short journeys, providing a permanent beneficial effect.

SUB-SCHEME 2 SUMMARY

12.7.47 The effects of Sub-scheme 2 are summarised in **Table 12-10** below.

Table 12-10 Sub-scheme 2 Summary of Effects

Sub-scheme	Options	Impact					
		All Travellers		Communities		People	
		Construction	Operation	Construction	Operation	Construction	Operation
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1: Signal control improvements	No change	Beneficial	No change	No change	Beneficial effect to minor adverse	TBA
	Level 2: Junction and signal improvements	No change	Beneficial	No change	No change	Beneficial effect to minor adverse	TBA

[410] Non-Motorised User

Sub-scheme	Options	Impact					
		All Travellers		Communities		People	
		Construction	Operation	Construction	Operation	Construction	Operation
	Level 3: Dualling full A3024 corridor	No change to Minor adverse	Slight beneficial to Minor adverse	Significant adverse to adverse	No change	Beneficial	beneficial to minor adverse

SUB SCHEME 3 – NORTHAM RAIL BRIDGE REPLACEMENT

Option 1 – new bridge / refurbish existing

Effect on All Travellers

12.7.48 Views from the road over Northam Rail Bridge are currently restricted by roadside barriers. It is likely that views from the road will remain as restricted or be reduced to no view, depending on the design of the new bridge, and therefore will only be subject to a change of minor significance.

12.7.49 Driver Stress may be temporarily increased as a result of construction works and associated traffic issues, but as levels of Driver Stress are already assumed to be high, there will be no change. However, it is expected that the improvements will improve traffic flows and reduce congestion locally resulting in a more effective network and an overall decrease in driver stress during operation.

12.7.50 The provision of shared footpath and cycleway will improve connectivity and amenity for users during the operational phase, providing a slight beneficial effect. NMU[411] may experience some temporary disruption and reduction in amenity during construction, causing a slight adverse effect.

Effects on Communities

12.7.51 This option will not directly impact upon any tourism or recreational facilities nor adversely affect future housing development. Although there are currently no community facilities or protected open spaces that would be affected, it is understood that Southampton Football Club has aspirations to develop this area to create a park.

12.7.52 Where widening is required outside of the highway boundary, there will be loss of private land. There may be some temporary disruption and reduction in amenity to those accessing community, private and tourist and recreational facilities during construction, causing temporary adverse effects.

Effects on People

12.7.53 It is not likely that there will be any direct impacts on areas of strategic growth and employment land allocations within Southampton.

12.7.54 Construction works will cause a temporary increase in employment and increase of spend in the local economy, resulting in a temporary beneficial effect.

12.7.55 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. It is anticipated at this stage that due to the decrease in congestion but likely increase in traffic flows, the impact on air quality will be at best neutral and at worse minor adverse.

12.7.56 Provision and improvement of off road NMU facilities is likely to encourage NMU travel modes for short journeys, providing a permanent beneficial effect.

[411] Non-Motorised User

Option 2 – new bridge / raise and refurbish existing bridge

Effects on All Travellers

12.7.57 The impact upon receptors is considered to be the same as Sub-scheme 3 Option 1.

Effects on Communities

12.7.58 The impact upon receptors is considered to be the same as Sub-scheme 3 Option 1.

Effects on People

12.7.59 The impact upon receptors is considered to be the same as Sub-scheme 3 Option 1.

Option 3A – construct a new two lane bridge and footpath cycleway, with the removal of subway on eastern side of bridge

12.7.60 Changes to the existing road network would be required which involve some demolition of the existing carriageway for the new alignment and additional land take of mainly vegetated areas. The subway on the eastern side of the bridge would be removed and replaced with a surface level crossing.

Effects on All Travellers

12.7.61 Effects for MTs are considered to be the same as Sub-scheme 3 Option 1.

12.7.62 NMUs may experience a slight increase in journey time if an 'at surface level crossing' is provided instead of the existing subway. There may also be some reduction in accessibility for NMU[412] such as cyclists or the disabled, if stairs are introduced, which would be a slight adverse effect where journey time would be increased.

Effects on Communities

12.7.63 The impact upon receptors is considered to be the same as Sub-scheme 3 Option 1.

Effects on People

12.7.64 The impact upon receptors is considered to be the same as Sub-scheme 3 Option 1.

Option 3B – construct a new two lane bridge and footpath cycleway, with retaining subway on eastern side of bridge

12.7.65 This options is broadly similar to Option 3A, however, it retains the subway.

Effects on All Travellers

12.7.66 The impact upon receptors is considered to be the same as Sub-scheme 3 Option 1.

Effects on Communities

12.7.67 The impact upon receptors is considered to be the same as Sub-scheme 3 Option 1.

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[412] Non-Motorised User

Effects on People

12.7.68 The impact upon receptors is considered to be the same as Sub-scheme 3 Option 1.

SUB-SCHEME 3 SUMMARY

12.7.69 The effects of Sub-scheme 3 are summarised in **Table 12-11** below.

Table 12-11 Sub-scheme 3 Summary of Effects

Sub-scheme	Options	Impact					
		All Travellers		Communities		People	
		Construction	Operation	Construction	Operation	Construction	Operation
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1: New bridge / Refurbish existing	No change to minor adverse	Slight beneficial	Adverse	No change	Beneficial	Beneficial to minor adverse
	Option 2: New bridge / Raise and refurbish existing	No change to minor adverse	Slight beneficial	Adverse	No change	Beneficial	Beneficial to minor adverse
	Option 3A: New bridge / Demolish and replace existing - close subway	No change to minor adverse	Slight beneficial	Adverse	No change	Beneficial	Beneficial to minor adverse
	Option 3B: New bridge / Demolish and replace existing - retain subway	No change to minor adverse	Slight beneficial	Adverse	No change	Beneficial	Beneficial to minor adverse

SUB SCHEME 5 – BITTERN BRIDGE WIDENING

Option 1 - install a tidal flow (lane control) system using traffic signals

12.7.70 This option requires no land take.

12.7.71 No adverse impacts are envisaged for this option as no or limited external constructions works are proposed.

12.7.72 There will be beneficial impacts for MTs as traffic flow is improved, reducing frustration and Driver Stress.

Option 2 - widen the existing bridge to the north only

Effect on All Travellers

12.7.73 Views from the road over Bitterne Rail Bridge are currently restricted by roadside barriers. It is likely that views from the road will remain as restricted and therefore will only be no change.

12.7.74 Driver Stress may be temporarily increased as a result of construction works and associated traffic issues but as levels of Driver Stress are already assumed to be high, there will be no change. However, it is expected that the improvements will improve traffic flows and reduce congestion locally resulting in a more effective network and an overall decrease in driver stress during operation.

12.7.75 The provision of shared footpath and cycleway will improve connectivity and amenity for users during the operational phase, providing a slight beneficial effect. NMU[413] may experience some slight temporary disruption and reduction in amenity during construction.

Effects on Communities

12.7.76 This option will not directly impact upon any tourism or recreational facilities nor adversely affect future housing development, or community land.

12.7.77 Widening of the road will result in some loss of private land to accommodate the works, causing a permanent adverse effect.

12.7.78 There may be some temporary disruption and reduction in amenity to those accessing community, private and tourist and recreational facilities during construction, causing temporary adverse effects.

Effects on People

12.7.79 It is not likely that there will be any direct impacts on areas of strategic growth and employment land allocations within Southampton.

12.7.80 Construction works will cause a temporary increase in employment and increase of spend in the local economy, resulting in a temporary beneficial effect.

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[413] Non-Motorised User

12.7.81 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. It is anticipated at this stage that due to the decrease in congestion but likely increase in traffic flows, the impact on air quality will be at best neutral and at worse minor adverse.

12.7.82 Provision and improvement of off road NMU facilities is likely to encourage NMU travel modes for short journeys, providing a permanent beneficial effect.

Option 3 - widen the existing bridge to the north only (least impact on land take) by means of replacing the existing deck with a new steel composite deck (Structural Option B)

12.7.83 The impacts associated with this option would be similar to those identified for Option 2 above.

SUB-SCHEME 5 SUMMARY

12.7.84 The effects of Sub-scheme 5 are summarised in **Table 12-12** below.

Table 12-12 Sub-scheme 5 Summary of Effects

Sub-scheme	Options	Impact					
		All Travellers		Communities		People	
		Construction	Operation	Construction	Operation	Construction	Operation
Sub-scheme 5: Bittern Bridge Widening	Option 1: Tidal flow gantry system	No change	Beneficial	No change	Beneficial	No change	Beneficial
	Option 2: Widening of existing bridge	No change	Slight beneficial	No change to adverse	No change to adverse	Beneficial	Beneficial - minor adverse
	Option 3: Replacement (widening) of existing deck	No change	Slight beneficial	No change to adverse	No change to adverse	Beneficial	Beneficial - minor adverse

DEVELOPMENT SCENARIOS ASSESSMENT

12.7.85 The overall impacts for each of the four development option scenarios (as detailed in **Section 3** of this ESR[414]) for consideration are discussed below.

Do Minimum - Smart Motorways without Scheme

12.7.86 This development option encompasses no Sub-Scheme options. At this high level assessment, this option is considered to have a Neutral impact.

Do Something 1 - Dualling of A3024 Corridor

12.7.87 This development option involves the combination of Sub Scheme 1 Option 1, Sub Scheme 2 Level 3, Sub Scheme 3 Option 3A, and Sub Scheme 5 Option 1.

Effects on All Travellers

12.7.88 Effects on MTs will be beneficial as driver stress will be reduced due to improved traffic flows during operation.

12.7.89 Improvements to NMU facilities will permanently increase connectivity and improve amenity, providing slight beneficial effects to users.

Effects on Communities

12.7.90 Loss of allotment land and loss and demolition of private land will have significant adverse effects on landowners and tenants. Effects on People

12.7.91 Construction works will increase spending in the local economy and will result in an increase in employment, providing beneficial effects.

12.7.92 The local economy will see beneficial effects as the chosen scheme will support growth and better access into Southampton.

12.7.93 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. It is anticipated at this stage that due to the decrease in congestion but likely increase in traffic flows, the impact on air quality will be at best neutral and at worse minor adverse.

12.7.94 NMU facilities will encourage more journeys to be taken by active travel modes. There will therefore be beneficial effects on the health of residents.

Do Something 2 – Signalised Junction Improvements of A3024 Corridor

12.7.95 This option involves the combination of Sub Scheme 1 Option 1, Sub Scheme 2 Level 1, Sub Scheme 3 Option 3A, and Sub Scheme 5 Option 1. This is similar to the Do Something 1 Option, but includes Sub Scheme 2 Level 1, as opposed to Level 3.

[414] Environmental Study Report

Effects on All Travellers

12.7.96 Effects on MTs will be beneficial as driver stress will be reduced due to improved traffic flows during operation.

12.7.97 Improvements to NMU facilities will permanently increase connectivity and improve amenity, providing slight beneficial effects to users. However, this effect will not be as significant as that seen for the Do Something 1 Option, as improvements will be limited to the geographical areas for Sub Scheme 1 Option 1, Sub Scheme 3 Option 3A, and Sub Scheme 5 Option 1.

Effects on Communities

12.7.98 There will be some loss of private land for the Do Something 2 Option, but there will be no residential demolitions required to accommodate the works, and no community land will be lost.

Effects on People

12.7.99 Construction works will increase spending in the local economy and will result in an increase in employment, providing beneficial effects.

12.7.100 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. It is anticipated at this stage that due to the decrease in congestion but likely increase in traffic flows, the impact on air quality will be at best neutral and at worse minor adverse.

12.7.101 NMU facilities will encourage more journeys to be taken by active travel modes. There will therefore be beneficial effects on the health of residents. This however, will be restricted to the geographical areas for Sub Scheme 1 Option 1, Sub Scheme 3 Option 3A, and Sub Scheme 5 Option 1.

Do Something 3 – Sub-Scheme 1 Only

12.7.102 This option comprises only Sub Scheme 1, Option 1.

Effects on All Travellers

12.7.103 Effects on MTs will be beneficial as driver stress will be reduced due to improved traffic flows during operation.

12.7.104 Improvements to NMU facilities will permanently increase connectivity and improve amenity, providing slight beneficial effects to users. However, this effect will not be as significant as that seen for the Do Something 1 or Do Something 2 Options, as improvements will be limited to the geographical areas for Sub Scheme 1 Option 1.

Effects on Communities

12.7.105 It is not considered that there will be any beneficial or adverse impacts on community facilities.

Effects on People

12.7.106 Construction works will increase spending in the local economy and will result in an increase in employment, providing beneficial effects.

12.7.107 It is unclear of how the changes in traffic flows on the A3024 will impact upon air quality until detailed assessment is carried out during subsequent PCF stages. It is anticipated at this stage that due to the decrease in congestion but likely increase in traffic flows, the impact on air quality will be at best neutral and at worse minor adverse.

12.7.108 NMU facilities will encourage more journeys to be taken by active travel modes. There will therefore be beneficial effects on the health of residents. This, however, will be restricted to the geographical areas for Sub Scheme 1 Option 1.

12.7.109 The Do Something 1 Option is likely to be the most impactful, both adversely and beneficially. Land take of private assets will be much higher for this option than for any other, and will also impact on small areas of open space and community land. Additionally amenity will be reduced where roadside vegetation is removed where widening is required. However, this option will have the most beneficial impact on driver stress and the local economy, improving access into Southampton City Centre.

12.7.110 Do Something 3 – Sub-scheme Option 1 only will have very localised impacts. There will be temporary adverse disruption on MTs and NMUs, but once operational, there will be slight beneficial effects for travellers, but on a much smaller scale than seen for other options.

12.7.111 The Do Minimum option would be the least impactful both adversely and beneficially. There will be no impact on private and community land but it is likely that the beneficial effects on driver stress and the local economy will be reduced in comparison to the other options.

12.8 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

12.8.1 A site visit has not been carried out at this stage of assessment, and therefore the assessment is based on publicly available data.

12.8.2 It is not known at the current stage of assessment where construction compounds and laydowns will be located, and therefore it is not known if any housing, private land or community assets will be affected by these.

12.8.3 At this stage, no detailed air quality modelling or traffic modelling is available to allow quantitative assessment of impacts on sensitive receptors, MTs and NMUs.

13 ROAD DRAINAGE AND THE WATER ENVIRONMENT

13.1 INTRODUCTION

13.1.1 This section provides a preliminary assessment of the potential effects on road drainage and the surrounding water environment caused by the construction and operation of the Sub-scheme options described in Section 3. The assessment of road drainage and the water environment will be undertaken in accordance with the methodology described in DMRB[415] Volume 11, Section 3, Part 10 (HD 45/09).

13.1.2 This section includes a high level assessment of the potential impacts to groundwater bodies associated with the generation of surface-borne pollutants, such as polluted surface water runoff. This section does not cover hydrogeological impacts associated with the disturbance of contaminated land. Potential impacts to groundwater resources and groundwater quality associated with these aspects will be addressed in **Section 9**.

13.1.3 This section includes an assessment of the potential impacts on ecological, chemical and hydromorphological quality elements of surface water features. However, the preliminary assessment of potential effects on ecological receptors, including aquatic ecology, is provided in **Section 8**.

13.1.4 Four sub-schemes and various options are identified for assessment at PCF Stage 1 (these are detailed in **Section 3.2**).

13.1.5 Current development options are summarised in **Section 3.2**, **Table 3-1**. The Do Minimum and three Do Something scenarios are comprised of various sub-scheme option combinations and are evaluated qualitatively in **Section 13.7** below.

13.1.6 Once the preferred option has been selected during PCF Stage 2, the detailed environmental assessment for that option will be supported by a Flood Risk Assessment that will provide a detailed assessment of potential impacts of flood risk on the selected option and to people and property elsewhere as a result of the selected option.

13.2 ASSESSMENT METHODOLOGY

13.2.1 The section provides a high-level qualitative assessment of the potential impacts of the improvement options on the water environment. The assessment is based on the layout information that is currently available for each of the options (see **Figure 1-1** Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0001) and **Appendix A**) and review of published mapping information.

13.2.2 The method of assessment and reporting of significant effects is based on HD 45/09 guidance. The value and sensitivity of a potential receptor is considered in terms of indicators such as quality, scale, rarity and substitutability.

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[415] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/

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

13.2.4 The criteria for assessing the magnitude of a potential impact are as developed from HD 45/09. Not all effects are adverse and there may be the potential for beneficial effects.

13.2.5 The overall significance of potential impacts considers both the magnitude of the impact against the value of the receptor as demonstrated in **Table 4-2**. In addition, the overall significance of an effect is also assessed with regards to the likelihood of the effect, the potential use of mitigation, and any legal obligations.

13.3 THE STUDY AREA

13.3.1 The study area consists of the sub-scheme options (as discussed in **Section 3.2**) and a 500m study area surrounding the maximum scheme extent. Features that may be affected by pollutants transported downstream of the works could be greater than 500m from the sub-scheme options and these features will also be included within the assessment as appropriate. Similarly, the potential impacts to flood risk could be experienced by receptors greater than 500m from the options and this is taken into consideration.

13.4 BASELINE CONDITIONS

13.4.1 Baseline information has been obtained from the following resources:

- Ordnance Survey mapping;
- The Environment Agency's (EA) online maps;
- The MAGIC[416] geographical information portal;
- The British Geological Survey (BGS);
- The Highways Agency Drainage Data Management System (HADDMS).

13.4.2 Watercourses, fluvial flood risk and water abstraction data is illustrated within the Water Constraints map, **Figure 13-1** (Drawing Reference HE551514 - WSP - GEN - M27 - FI - GIS – 0019).

[416] Multi Agency Geographic Information for the Countryside

Figure 13-1 Water Constraints

SURFACE WATER FEATURES

13.4.3 All the sub-schemes are situated to the north of the River Test. The River flows in a south easterly direction and is known as Southampton Water in its downstream extents, prior to its discharge to the Solent approximately 10km downstream of the study area.

13.4.4 The Sub-scheme options are located to the west and east of the River Itchen. The River Itchen flows in a southerly direction to the east of Southampton city centre, and discharges to the River Test adjacent to Southampton Harbour. The works closest to the River Itchen are Sub-Scheme 3 located approximately 420m west of the river, and Sub-Scheme 5 located approximately 160m east of the river.

13.4.5 The River Hamble is located to the east of the Sub-scheme options, approximately 1.5km to the east of Junction 8 of the M27. The River Hamble flows in a southerly direction past the village of Bursledon, and discharges to Southampton Water between the villages of Hamble-le-Rice and Warsash.

13.4.6 The River Test, River Itchen and River Hamble are designated as main rivers under the jurisdiction of the EA[417] and are tidally influenced within the study area.

13.4.7 Water quality within the tidal River Test, River Itchen, River Hamble and Southampton Water is monitored against the objectives of the WFD[418]. Current ecological quality is assessed to be moderate and current chemical quality is assessed to have failed due to the presence of Tributyltin Compounds. The River Test, River Itchen, River Hamble, Southampton Water and Solent are heavily navigated by commercial and leisure vessels which may account for the presence of this substance that is toxic to many organisms, but that is now banned.

13.4.8 An unnamed ordinary watercourse flows to the north of the A3024 Maybray King Way (west of Westend Road) and Bitterne Road West, crossing beneath Bitterne Road West immediately to the west of Bitterne Rail Bridge close to Sub-scheme 5. From here the watercourse continues south to discharge to the River Itchen. The upstream extent of the watercourse is understood to be classified as an ordinary watercourse under the jurisdiction of SCC[419] as Lead Local Flood Authority (LLFA), and the downstream extent of the watercourse (in the vicinity of Sub-Scheme 5) in designated as a main river under the jurisdiction of the EA.

13.4.9 An ordinary watercourse appears to flow from north-east to south-west beneath the A3024 Maybray King Way adjacent to the Bitterne shopping complex, within the extent of Sub-scheme 2. The watercourse is believed to be culverted along much of its length and is assumed to discharge to the River Itchen to the south-west. The watercourse is understood to be under the jurisdiction of SCC as LLFA.

13.4.10 Two ordinary watercourses flow from north-east to south-west beneath the A3024 Bursledon Road at Sholing Common and Weston Common, within the extent of the proposed Sub-scheme 2. The watercourses flow predominantly within open channels (although likely to be heavily modified) and are understood to be under the jurisdiction of SCC as LLFA. They appear to confluence to the north of Mayfield Park and continue to flow in a south-westerly direction through Mayfield Park to discharge to the River Itchen.

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[417] Environment Agency
[418] Water Framework Directive
[419] Southampton City Council

13.4.11 A number of minor watercourses and drains are indicated to be located within the vicinity of Windhover Roundabout and Junction 8 of the M27, within 500m of the proposed Sub-scheme 1. The drains appear to convey surface water runoff from adjacent agricultural land and springs to an ordinary watercourse that subsequently drains through the villages of Lowford and Bursledon prior to discharge to the River Hamble.

13.4.12 Water quality of the ordinary watercourses discussed above is not monitored against the objectives of the WFD[420].

DESIGNATIONS

13.4.13 The tidal mudflats on the eastern bank of the River Itchen, including those within the vicinity of the A3024 Bitterne Road West as it crosses the River Itchen, and the northern bank of the River Test have been awarded a number of International, European and National designations. These include the Solent and Southampton Water Ramsar site, Lee-on-the-Solent to Itchen Estuary SSSI[421], and Solent and Southampton Water Special Protection Area.

13.4.14 The tidal mudflats on the eastern bank of the River Itchen approximately 500m downstream of the A3024 Bitterne Road West as it crosses the River Itchen (and approximately 160m south of the Sub-Scheme 5 works) form part of the Chessel Bay Nature Reserve. The mudflats provide feeding grounds for wading birds and wildfowl at low tide. This described as the only remaining stretch of undeveloped, natural shoreline in the lower River Itchen.

13.4.15 The River Hamble to the south-east of Sub-Scheme 1 supports a number of European and National designations including the Solent and Southampton Water Ramsar site, Solent and Southampton Water Special Protection Area, Lincegrove and Hackett's Marshes SSSI, Lee-on-the-Solent to Itchen Estuary SSSI, Solent Maritime SAC[422].

13.4.16 The River Itchen, River Test and River Hamble and Southampton Water are also designated shellfish waters.

SURFACE WATER ABSTRACTIONS

13.4.17 The EA Water Abstraction Licences map indicates that there are licensed surface water abstractions within the study area. A medium size abstraction is located approximately 450m south of the A3024, closest to Sub-scheme 3m with water abstracted from the River Itchen. Review of the EA information available indicates that the abstracted water is used for industrial and commercial purposes.

DRAINAGE FEATURES

13.4.18 The A3024 and M27 are served by drainage gullies located within the carriageway. Details of this system, including the size/alignment of the below ground system, provision of attenuation and treatment systems, and outfall to the receiving water environment, are unknown at this stage. A drainage survey will be undertaken at a later design stage to gain further information about the current surface water drainage of the Scheme area.

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[420] Water Framework Directive
[421] Sites of Special Scientific Interest
[422] Special Areas for Conservation

FLOOD RISK

13.4.19 Review of the EA[423] Flood Map for Planning (Rivers and Sea) indicates that the vast majority of the study area, including all of Sub-Schemes 1 and 5, is located within the low risk Flood Zone 1. Land within Flood Zone 1 is assessed to have an annual probability of flooding from fluvial or tidal sources of less than 1 in 1000 (<0.1%).

13.4.20 Land within the vicinity of the proposed Sub-scheme 2 is indicated to be located within the high risk Flood Zone 3, including land immediately to the east of the River Itchen at the location of the A3024 Bitterne Road West (west of Hawkewood Road) and land immediately to the west of the River Itchen at the location of the A3024 Northam Road (east of the railway).

13.4.21 Sub-scheme 3 is indicated to be partially located within the medium risk Flood Zone 2 where the road crosses the railway, however this risk appears to be associated with the railway that is located beneath the road at this located. Land located immediately to the east of Sub-Scheme 3 is indicated to be located within the high risk Flood Zone 3 as discussed above, although this is beyond the extent of the Scheme area.

13.4.22 Land within Flood Zone 2 assessed to have between a 1 in 1000 (0.1%) and 1 in 100 (1%) annual probability of river flooding, or between a 1 in 1000 (0.1%) and 1 in 200 (0.5%) annual probability of flooding from the sea. Land within Flood Zone 3 is assessed to have a 1 in 100 or greater (>1%) annual probability of river flooding, or a 1 in 200 or greater (>0.5%) annual probability of flooding from the sea. The source of this flooding is considered likely to be the River Itchen, although the source and nature of this flooding will need to be confirmed during PCF Stage 2 and in consultation with the EA.

13.4.23 The EA Risk of Flooding from Surface Water map identifies overland flow routes associated with the ordinary watercourses identified in earlier sections of this report. Flooding of the A3024 may occur if water within the channel of the identified watercourses exceeds the capacity of the channel and flows overland, although the risk is likely to be low. Of particular note is ponding of surface water at ground level adjacent to the Bitterne Rail Bridge, as well as ponding of surface water adjacent to the west and south of the road at Junction 8 of the M27. These areas are identified to be at high risk of surface water flooding, assessed as having a greater than 1 in 30 annual probability of flooding (>3.3%).

13.4.24 The EA Risk of Flooding from Surface Water map indicates that flooding from surface water could occur to the south and east of Sub-scheme 3, but the risk is largely considered to be very low risk and will not affect the A3024 which is elevated at this location. The flooding is likely to correspond with localised topographical depressions.

13.4.25 Review of the EA Risk of Flooding from Reservoirs map indicates flood risk associated with the failure or breach of High Wood reservoir, although flooding is indicated to be contained within the River Itchen and is therefore considered to pose negligible risk to all sub-scheme options.

GROUNDWATER

13.4.26 Review of the EA Groundwater map shows that there are no designated groundwater SPZs[424] within the study area.

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[423] Environmental Agency
[424] Source Protection Zones

13.4.27 Review of the BGS Geology of Britain Viewer 1:50,000 mapping indicates that bedrock geology within the study area comprises predominantly London Clay Formation (clay, silt and sand) and Wittering Formation (sand, silt and clay). A small area of Portsmouth Sand Member is present to the east of Sub-scheme 5, most likely associated with the historic alignment of a watercourse. Review of the EA's Groundwater map indicates that the bedrock geology is classified as Secondary A Aquifer.

13.4.28 Review of the BGS Geology of Britain Viewer 1:50,000 mapping indicates that superficial deposits within the study area comprise Tidal Flat Deposits (clay and silt) adjacent to the River Itchen, and River Terrace deposits (sand and gravel) throughout other areas, although coverage is not consistent. Review of the EA's Groundwater map classifies the River Terrace Deposits as Secondary A Aquifer and the Tidal Flat Deposits as Unproductive Strata.

13.4.29 Secondary A aquifers are described as permeable layers capable of supporting water supplies at a local scale, and can sometimes form an important source of base flow to rivers. Groundwater in the study area has been assessed against the objectives of the WFD[425]. The EA River Basin Management Plan (RBMP) Groundwater map identifies the groundwater body underlying the site to be Central Hants Bracklesham Group with current quantitative quality assessment as 'Good' and current chemical quality assessed as 'Good'.

SUMMARY

13.4.30 At this stage, the receptors that are most likely to be affected by the sub-scheme options are indicated in **Table 13-1**:

Table 13-1 Sensitive Receptors

Receptor	Attributes	Importance
River Itchen	→ Main river. → Moderate ecological quality. → Use for non-potable water supply. → Shellfish waters. → High recreational value. → Multiple International, European and National Designations.	Very High
River Test / Southampton Water	→ Main river. → Moderate ecological quality. → High recreational value. → Shellfish waters. → Multiple International, European and National Designations.	Very High
River Hamble	→ Main river. → Moderate ecological quality. → High recreational value. Shellfish waters. → Multiple International, European and National Designations.	Very High

[425] Water Framework Directive

Receptor	Attributes	Importance
Ordinary Watercourses within Study Area	→ Ordinary watercourse. → No known designations and unknown ecological value. → No known abstractions. → Flow through urban and recreational areas.	High
Groundwater Resources	→ Secondary A aquifer. → Not is a designated SPZ. → No known groundwater abstractions within study area. → Good chemical quality.	Medium
Potential flood risk receptors	→ Densely urban areas comprising predominantly residential, commercial, industrial and educational development.	High

13.5 REGULATORY AND POLICY FRAMEWORK

13.5.1 The management of water resources is governed by a range of legislative guidance set out in international, national and regional policies and plans. The assessment has been prepared whilst taking these plans and policies into account.

13.5.2 The coordination of policies for the water environment is managed by Defra[426]. Many flood risk and water quality requirements are set at European level, which are then transposed into UK law. The enforcement of flood risk and water quality requirements in England is managed by the EA.

EUROPEAN POLICY

WATER FRAMEWORK DIRECTIVE (2000/60/EC)

13.5.3 The main aims of the legislation are to ensure that all surface water and groundwater in Europe reaches 'good' status (in terms of ecological and chemical quality and water quantity, as appropriate), promote sustainable water use, reduce pollution and contribute to the mitigation of flood and drought.

13.5.4 The WFD[427] also contains provisions for controlling discharges of dangerous substances to surface waters and groundwater and includes 'Lists of Priority Substances'. The purpose of the directive is to eliminate pollution from List I substances and reduce pollution from List II substances. The scheme will include mitigation measures to prevent pollution of groundwater and surface water.

GROUNDWATER DIRECTIVE (2006/118/EC)

13.5.5 This Groundwater Directive aims to set groundwater quality standards and introduce measures to prevent or limit pollution of groundwater, including those listed with the 'List of Priority Substances'. The directive has been developed in response to the requirements of Article 17 of the WFD, specifically the assessment of chemical status of groundwater and objectives to achieve 'good' status.

FLOODS DIRECTIVE (2007/60/EC)

13.5.6 The Floods Directive requires Member States to assess if all watercourses and coast lines are at risk from flooding, map the flood extent and assets and humans at risk in these areas, and take adequate and coordinated measures to reduce this flood risk.

[426] Department for Environment, Food and Rural Affairs
[427] Water Framework Directive

NATIONAL POLICY

NATIONAL PLANNING POLICY FRAMEWORK

13.5.7 The NPPF[428] sets out the Government's planning policies for England. Planning Practice Guidance 'Flood Risk and Coastal Change' has been published alongside the NPPF. These documents identify how new developments must take into account flood risks, including making allowance for climate change impacts, and ensure no increase risk to people and property elsewhere.

13.5.8 All applications in the following areas should be accompanied by a FRA[429] – all projects in Flood Zones 2 and 3 (medium and high probability of river and tidal flooding); projects of 1ha or greater in Flood Zone 1 (low probability of river and tidal flooding); projects which may be at significant risk from other sources of flooding (local watercourses, surface water, groundwater or reservoirs); or where the EA has notified the local planning authority that there are critical drainage problems. A FRA will be prepared at PCF Stage 3.

NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS

13.5.9 Paragraph 5.96 of the NN NPS[430] advises applicants for projects that may be affected by or may add to flood risk to seek sufficiently early pre-application discussions with the EA, and where relevant other flood risk management bodies. Examples of other flood risk management bodies are LLFA[431], Internal Drainage Boards, sewerage undertakers, highways authorities and reservoir owners and operators.

ENVIRONMENTAL PERMITTING (ENGLAND AND WALES) REGULATIONS 2010

13.5.10 The Environmental Permitting (England and Wales) Regulations 2010 specify that it is an offence to cause or knowingly permit a water discharge activity, including the discharge of polluting materials to freshwater, coastal waters, relevant territorial waters or groundwater unless complying with an exemption or an environmental permit. Any environmental permit required for the scheme will be obtained from the EA.

LOCAL POLICY

SOUTHAMPTON CITY COUNCIL CORE STRATEGY DEVELOPMENT PLAN (2015)

13.5.11 The Core Strategy contains the following policies that relate to the management of flood risks and surface water runoff:

13.5.12 Policy CS 20 – Tackling and Adapting to Climate Change: The policy promotes the use of SUDS[432] and measures to reduce or avoid water contamination and safeguard groundwater supply within all development, unless it can be demonstrated that this is not appropriate in a specific location.

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[428] National Planning Policy Framework (Department of Communities and Local Government); (2012): [online] available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2
[429] Flood Risk Assessment
[430] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[431] Lead Local Flood Authority
[432] Sustainable Drainage Systems

13.5.13 Policy CS 23 – Flood Risk: The policy requires development will achieve an appropriate degree of safety taking into account standards of defence and sea level rise over the life of the development.

13.5.14 The scheme will consider the use of SUDS and the implications associated with defence standards and sea level rise.

13.6 DESIGN, MITIGATION AND ENHANCEMENT MEASURES, INCLUDING MONITORING REQUIREMENTS

MITIGATION INCLUDED IN DESIGN

13.6.1 A number of standard mitigation measures should be incorporated within the design of the preferred Option, once it is selected at PCF[433] Stage 2, to limit impacts of the scheme. Currently there is not sufficient detail on the sub-schemes and options to determine which mitigation would be appropriate for each sub-scheme option within this ESR[434].

13.6.2 The current designs for the Sub-scheme options attempt to utilise as much of the existing carriageway and structures (bridges) as feasible. Maximising the use of the existing road and structures will reduce the requirement for additional mitigation.

MITIGATION APPLIED DURING CONSTRUCTION

13.6.3 Mitigation during construction will be managed through the implementation of a CEMP[435]. The CEMP will be prepared in alignment with IAN 183/14[436] and will be adopted during the construction stage to limit the risk of pollutants entering surface water features or discharging to ground.

13.6.4 The CEMP will detail the procedures and methods that must be followed to minimise the potential environmental effects of construction activities. The CEMP will also describe the procedures to be followed in the event of an environmental emergency such as a fuel or chemical spillage.

13.6.5 For the most part, the implementation of a robust CEMP will be sufficient to mitigate potential risks to a residual negligible or neutral impact magnitude. Only when works are immediately adjacent to or within a watercourse will a notable residual risk be likely to remain. A summary of risks for each Sub-scheme option is provided below.

MITIGATION APPLIED DURING OPERATION

13.6.6 Mitigation during operation should be managed through the implementation of a robust surface water drainage system. Little is currently known about the existing drainage system and further information will be required to inform the detailed design of the preferred Option at PCF Stage 3.

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[433] Project Control Framework
[434] Environmental Study Report
[435] Construction Environmental Management Plan
[436] Interim Advice Note (IAN)184/14; Highways England; Web Reference http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm

13.7 OVERALL ASSESSMENT

13.7.1 The sub-scheme options have the potential to impact the water environment during construction and operation. An assessment of the potential impacts is provided below.

CONSTRUCTION EFFECTS

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

- Impacts on the water quality of identified water features (i.e. the River Test/ the River Itchen/ Southampton Water and/ or the groundwater bodies) in the vicinity of the construction works from mobilised suspended solids or spillage fuels, lubricants, cements and hydraulic fluids from construction plant if there are inadequate mitigation measures in place.
- Temporary interception of overland flood flow routes which could cause localised flooding of low lying topography.

13.7.3 Impacts associated with permanent changes to catchment hydrology, river hydraulics or loss of flood water storage are assessed as operational impacts.

13.7.4 At this stage little is known about the existing highway drainage system but it is considered likely that any discharge from the scheme will drain to the River Test/Southampton Water either directly or through other minor watercourses. There is therefore a risk of suspended solids, fuels, lubricants from construction plant and cements discharging to this watercourse through the surface water drainage system. Works adjacent to watercourses will pose the greatest risk, as will major works such as demolition and construction of new structures or road/junction alignments.

SUB-SCHEME 1 M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

OPTION 1, 2, 3, 4 AND 5

13.7.5 The potential effects for these five options are expected to be the same, so their findings have been presented together.

13.7.6 The works are not located within close proximity of the ordinary watercourses within this area and are therefore considered to have a neutral impact to the quality of surface water features within the study area. This assumes a robust CEMP[437] is implemented that gives due consideration to pollutants that may be transported within the highway drainage system.

13.7.7 The risk of direct migration of pollutants to the ground and the Secondary A aquifer underlying the scheme is considered to be low given the nature of the proposed works that are not expected to require deep excavations or structures. It is likely that risks to groundwater resources can be adequately mitigated through the implementation of the CEMP and therefore the magnitude of the impact is likely to be negligible.

[437] Construction Environmental Management Plan

13.7.8 The proposed widening of the carriageway on the northbound slip road of the A3024 to Junction 8 of the M27 will encroach to within an area identified to be at risk of surface water flooding, however given the temporary nature of the works and considering that the works will not alter flood flow conveyance routes, the impact during construction is considered to be negligible.

13.7.9 A summary of risks identified in this high level assessment is provided in **Table 13-2** below.

Table 13-2 SS1 Option 1, 2, 3 and 4 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 1, 2, 3 and 4	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Negligible	Neutral
	Ordinary Watercourses	Pollution risks	Neutral	Neutral
	Road users and people and property elsewhere	Impact to flood flow or storage	Negligible	Slight Adverse

SUB SCHEME 2 – A3024 EASTERN ACCESS CORRIDOR

13.7.10 Three Options for increasing capacity and reducing journey times along the A3024 corridor have been identified. Northam Rail Bridge (Sub Scheme 3) and Bitterne Rail Bridge (Sub-scheme 5) sections are considered separately under different Sub Schemes.

LEVEL 1 SIGNAL CONTROL IMPROVEMENTS

13.7.11 Level 1 improvements include UTC[438] and traffic signal controller reconfiguration at signalised junctions to enable GO[439] to eliminate running side roads for longer green times than required. Existing kerb lines and traffic signal infrastructure are to be retained and there are no proposed changes to kerblines.

13.7.12 Assuming appropriate care is taken during the construction phase, the potential impact to the quality of the water environment will be negligible and the works are not considered to have any impact to existing watercourses or flood conveyance within the study area. A summary of risks identified in this high level assessment is provided in **Table 13-3** below.

Table 13-3 SS2 Level 1 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Level 1	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Neutral	Neutral
	People and property elsewhere	Impact to flood flow or storage	Neutral	Neutral

[438] Urban Traffic Control
[439] Gap Out

LEVEL 2 JUNCTION AND SIGNAL IMPROVEMENTS

13.7.13 The work will include minor changes to kerblines at junctions (introducing flares and turning pockets) to improve localised stop-line capacity. It is assumed that existing drainage systems will be retained.

13.7.14 As construction works are minimal and will not require extensive or deep excavation, the potential impact to the quality of the water environment is likely to be negligible and easily managed through good site practice. The works are not considered to have any impact to existing watercourses or flood conveyance within the study area,

13.7.15 A summary of risks identified in this high level assessment is provided in **Table 13-4** below.

Table 13-4 SS2 Level 2 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Level 2	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Negligible	Neutral
	Groundwater Resources	Pollution risks	Negligible	Neutral
	People and property elsewhere	Impact to flood flow or storage	Neutral	Neutral

LEVEL 3 DUALLING FULL A3024 CORRIDOR

13.7.16 The proposed road widening works are within the vicinity of the ordinary watercourse that flows beneath the A3024 at Sholing Common (passing beneath the A3024 Bursledon Road to the east of Deacon Road and Upper Deacon Road). The works could therefore lead to migration of pollutants contained within overland flow.

13.7.17 No other works within Sub-Scheme 2 (all options) are considered to pose notable risk to the water environment, assuming a robust CEMP[440] is implemented that gives due consideration to pollutants that may be transported within the highway drainage system.

13.7.18 The risk of direct migration of pollutants to the ground and the Secondary A aquifer underlying the scheme is considered to be low given the nature of the proposed works that are not expected to require deep excavations or structures. It is likely that risks to groundwater resources can be adequately mitigated through the implementation of the CEMP and therefore the magnitude of the impact is likely to be negligible.

13.7.19 The proposed road widening works for Sub-Scheme 2 (Level 3) within the vicinity of the ordinary watercourse discussed above are indicated to be to the north of the carriageway and not indicated to require any amendments to be made to the existing culvert that conveys the watercourse beneath the carriageway. The impact of the proposed works on flood risk associated with this watercourse is therefore considered to be negligible.

13.7.20 A summary of risks identified in this high level assessment is provided in **Table 13-5** below.

[440] Construction Environmental Management Plan

Table 13-5 SS2 Level 3 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Level 3	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Minor Adverse	Slight Adverse
	Groundwater Resources	Pollution risks	Negligible	Neutral
	People and property elsewhere	Impact to flood flow or storage	Neutral	Neutral

SUB SCHEME 3 – NORTHAM RAIL BRIDGE REPLACEMENT

OPTIONS 1 AND 2

13.7.21 The potential effects for options 1 and 2 are expected to be the same, so their findings have been presented together.

13.7.22 The proposed works are located approximately 420m from the River Itchen. The direct migration of pollutants from the construction site to the River Itchen (as contained within overland flow) is unlikely given the existing urban development that is present between the A3024 and the River Itchen. Assuming that a robust CEMP[441] is implemented that gives due consideration to pollutants that may be transported within the highway drainage system, the residual impact is likely to be negligible.

13.7.23 The proposed works may require deep excavation and/or deep foundations to support any new bridge structure. There may therefore be a risk of direct migration of pollutants to the ground and the Secondary A aquifer underlying the scheme, although the depth to the groundwater table is currently unknown and will require further investigation during detailed design. It is likely that risks to groundwater resources can be adequately mitigated through the implementation of the CEMP and therefore the magnitude of the impact is likely to be negligible.

13.7.24 The proposed works are partially located within an area identified as Flood Zone 2. The works may temporarily alter flood flow conveyance in this area, but given the relatively minimal extent of Flood Zone 2 and the low risk of flooding, the works are not predicted to increase flood risk to the Scheme or to people and property elsewhere.

13.7.25 The impacts associated with Option 2 would be similar to those identified for Option 1

13.7.26 A summary of risks identified in this high level assessment is provided in **Table 13-6** below.

Table 13-6 SS3 Option 1 and 2Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 1 and 2	River Itchen	Pollution risks	Negligible	Slight Adverse
	River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral

[441] Construction Environmental Management Plan

Option	Receptor	Impact	Magnitude	Significance
	Groundwater Resources	Pollution risks	Negligible	Neutral
	People and property elsewhere	Impact to flood flow or storage	Negligible	Neutral

OPTION 3A AND 3B

13.7.27 The potential effects for options 3a and 3b are expected to be the same, so they findings have been presented together.

13.7.28 The potential impacts identified for Option 3A and 3B are considered to be similar as those identified for Option 1. The exception is that the extent of the proposed bridge works and removal of the subway may increase the risk of pollution to groundwater resources.

13.7.29 A summary of risks identified in this high level assessment is provided in **Table 13-7** below.

Table 13-7 SS3 Option 3A and 3BRisks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 3A and 3B	River Itchen	Pollution risks	Negligible	Slight Adverse
	River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Minor Adverse	Slight Adverse
	People and property elsewhere	Impact to flood flow or storage	Negligible	Neutral

SUB SCHEME 5 – BITTERNE RAIL BRIDGE WIDENING

13.7.30 This Sub Scheme proposes to provide 2-way operation across Bitterne Rail Bridge.

OPTION 1

13.7.31 This Option involves installing a tidal flow lane control system at Bitterne Rail Bridge (no road or bridge widening)

13.7.32 The proposed works are not considered to cause any notable risk to the quality of the water environment or to flood risk.

13.7.33 A summary of risks identified in this high level assessment is provided in **Table 13-8** below.

Table 13-8 SS5 Option 1 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 1	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Negligible	Neutral
	People and property	Impact to flood flow	Neutral	Neutral

Option	Receptor	Impact	Magnitude	Significance
	elsewhere	or storage		

OPTION 2 AND 3

13.7.34 The potential effects for options 2 and 3 are expected to be the same, so their findings have been presented together.

13.7.35 The proposed works are located approximately 160m from the River Itchen. However, the direct migration of pollutants from the construction site to the River Itchen (as contained within overland flow) is unlikely given the existing urban development that is present between the A3024 and the River Itchen. Assuming that a robust CEMP[442] is implemented that gives due consideration to pollutants that may be transported within the highway drainage system, the residual impact is likely to be negligible.

13.7.36 The proposed works are not located within close proximity to the ordinary watercourse identified to the north and west of the existing Bitterne Rail Bridge. The works are therefore not considered to pose significant risk to this feature, assuming that a robust CEMP is implemented that gives due consideration to pollutants that may be transported within the highway drainage system.

13.7.37 The proposed works may require deep excavation and/or deep foundations to support the extended bridge structure. There may therefore be a risk of direct migration of pollutants to the ground and the Secondary A aquifer underlying the scheme, although the depth to the groundwater table is currently unknown and will require further investigation during detailed design. It is likely that risks to groundwater resources can be adequately mitigated through the implementation of the CEMP and therefore the magnitude of the impact is likely to be negligible.

13.7.38 The proposed works will encroach to within an area identified to be at risk of surface water flooding, however impacts during construction will be temporary and are considered unlikely to alter flood flow conveyance routes. The impact during construction is therefore considered to be negligible.

13.7.39 A summary of risks identified in this high level assessment is provided in **Table 13-9** below.

Table 13-9 SS5 Option 2 and 3 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 2 and 3	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Negligible	Slight Adverse
	Ordinary Watercourses	Pollution risks	Negligible	Slight Adverse
	Groundwater Resources	Pollution risks	Negligible	Neutral
	People and property elsewhere	Impact to flood flow or storage	Negligible	Slight Adverse

[442] Construction Environmental Management Plan

OPERATIONAL EFFECTS

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

- Polluted surface water runoff consisting of silts or hydrocarbons from the Scheme Options that may migrate or be discharged to surface water or groundwater features.
- Increased rates and volumes of surface water runoff from an increase in impermeable area and/or changes to the existing drainage regime leading to a potential increase in flood risk.
- Increased flood risk associated with the location of the Scheme Options within an area at risk of flooding.

13.7.41 The proposed works intend to improve traffic flow through Southampton but are considered unlikely to notably increase the deposition of pollutants that may be transferred to the water environment via the highway drainage system. Assuming that an appropriate surface water drainage system is maintained as per the current situation, the magnitude of the impact to surface water or groundwater features will be negligible.

13.7.42 Other potential impacts are discussed for each of the Scheme Options below.

SUB-SCHEME 1 M27 JUNCTION 8 AND WINDHOVER ROUNDABOUT UPGRADES

OPTION 1, 2, 3, 4 AND 5

13.7.43 The potential effects for these five options are expected to be the same, so their findings have been presented together.

13.7.44 The proposed carriageway widening will increase the impermeable area of the road and will therefore lead to an increase in the rate and volume of surface water runoff that will enter the highway drainage system. A detailed assessment of this increase and the potential impact that this may have on the capacity of the drainage system and flood risk to users of the road and elsewhere will be undertaken at PCF Stage 3. Appropriate drainage and attenuation features will be implemented as necessary. However, given the relatively small size of the likely increase in impermeable area, the residual impacts are considered to be negligible.

13.7.45 The proposed widening of the carriageway on the northbound slip road of the A3024 will encroach to within an area identified to be at risk of surface water flooding. Further consideration will need to be given to the cause of this flood risk and the potential displacement of this water that could increase risk to properties located immediately to the west of the junction. The risks are, however, considered to be minor and relatively easy to mitigate.

13.7.46 A summary of risks identified in this high level assessment is provided in **Table 13-10** below.

Table 13-10 SS1 Option 1, 2, 3, 4 and 5 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 1, 2, 3, 4 and 5	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Neutral	Neutral
	Road users and people and property elsewhere	Increased surface water runoff	Negligible	Slight Adverse

Option	Receptor	Impact	Magnitude	Significance
	Road users and people and property elsewhere	Impact to flood flow or storage	Minor Adverse	Slight Adverse

SUB-SCHEME 2 – A3024 EASTERN ACCESS CORRIDOR

13.7.47 Three Options for increasing capacity and reducing journey times along the A3024 corridor have been considered.

LEVEL 1 AND 2

13.7.48 The potential effects for these two options are expected to be the same, so their findings have been presented together:

13.7.49 For level 1 the existing highway drainage systems will be retained and the works will result in no notable increase in impermeable area that would subsequently increase the rate or volume of surface water runoff. The works will also require no amendments to be made to existing watercourses within the study area. The impact to the water environment and to increase flood risk will therefore be neutral.

13.7.50 For level 2, the minor realignment of kerblines will change existing impermeable surfaces but these amendments will not be sufficient to notably increase the rate or volume of surface water runoff and all surface water runoff will continue to be managed using existing drainage systems. The works are not predicted to require any amendments to be made to existing watercourses within the study area. The impact to the water environment and to increase flood risk will therefore be neutral.

13.7.51 A summary of risks identified in this high level assessment is provided in **Table 13-11** below.

Table 13-11 SS2 Level 1 and 2 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Level 1 and 2	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Neutral	Neutral
	People and property elsewhere	Increased surface water runoff	Neutral	Neutral
	People and property elsewhere	Impact to flood flow or storage	Neutral	Neutral

LEVEL 3

13.7.52 The proposed carriageway widening works will increase the impermeable area of the road and will therefore lead to an increase in the rate and volume of surface water runoff that will enter the highway drainage system. A detailed assessment of this increase and the potential impact that this may have on the capacity of the drainage system and flood risk to users of the road and elsewhere has not been undertaken at this stage. This will need to be undertaken during Scheme development and appropriate drainage and attenuation features implemented as necessary. Given that the widening of the carriageway is relatively significant, a minor adverse impact magnitude is recommended at this stage.

13.7.53 Road widening works proposed for Level 3 are within the vicinity of the ordinary watercourse that flows beneath the A3024 at Sholing Common (passing beneath the A3024 Bursledon Road to the east of Deacon Road and Upper Deacon Road). However, works in this area are indicated to be to the north of the carriageway and not indicated to require any amendments to be made to the existing culvert that conveys the watercourse beneath the carriageway. The impact of the proposed works on flood risk associated with this watercourse is therefore considered to be neutral.

13.7.54 A summary of risks identified in this high level assessment is provided in **Table 13-12** below.

Table 13-12 SS2 Level 3 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Level 3	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Neutral	Neutral
	People and property elsewhere	Increased surface water runoff	Minor Adverse	Slight Adverse
	People and property elsewhere	Impact to flood flow or storage	Neutral	Neutral

SUB SCHEME 3 – NORTHAM RAIL BRIDGE REPLACEMENT

OPTION 1 – NEW BRIDGE / REFURBISH EXISTING

13.7.55 The potential effects for these four options are expected to be the same, so they findings have been presented together.

13.7.56 The works for Option 1 will increase the impermeable area of the road when compared to the existing Northam Rail Bridge as the works will introduce a larger area of hard surface to the north. There will therefore be an increase in the rate and volume of surface water runoff that will enter the highway drainage system.

13.7.57 A detailed assessment of this increase and the potential impact that this may have on the capacity of the drainage system and flood risk to users of the road and elsewhere has not been undertaken at this stage. This will need to be undertaken during Scheme development and appropriate drainage and attenuation features implemented as necessary. The increase in impermeable area is moderate when considered in a local context, although the overall impact to flood risk is likely to be negligible and can be mitigated through the provision of a new carriageway drainage system.

13.7.58 The proposed works are located within an area identified as Flood Zone 2. However, as the A3024 is located above this area and the flood risk appears to be associated with the railway that is at a lower elevation, the proposed works are highly unlikely to be at risk of flooding or increase flood risk elsewhere. It is recommended, however, that consideration is given to the potential interaction of the proposed bridge piers with the flooding regime in this area to a) ensure that flood risk to the railway is not increased and, b) identify potential opportunities to reduce flood risk to the railway.

OPTION 2 – NEW BRIDGE / RAISE AND REFURBISH EXISTING

13.7.59 The impacts associated with Option 2 would be similar to those identified for Option 1.

OPTION 3A – NEW BRIDGE / DEMOLISH AND REPLACE EXISTING - CLOSE SUBWAY

13.7.60 The potential impacts identified for Option 3A are considered to be similar as those identified for Option 1. Whilst the works will introduce a new bridge surface and therefore increase the area of new hard standing, the total impermeable area will be similar to Options 1 and 2 and can be mitigated through the provision of a new carriageway drainage system.

OPTION 3B – NEW BRIDGE / DEMOLISH AND REPLACE EXISTING - RETAIN SUBWAY

13.7.61 The impacts associated with Option 3B would be similar to those identified for Option 3A.

13.7.62 A summary of risks identified in this high level assessment is provided in **Table 13-13** below.

Table 13-13 SS3 Option 1, 2, 3a and 3B Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 1, 2, 3A and 3B	River Itchen	Pollution risks	Neutral	Neutral
	River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Neutral	Neutral
	People and property elsewhere	Increased surface water runoff	Negligible	Slight Adverse
	People and property elsewhere	Impact to flood flow or storage	Negligible	Slight Adverse

SUB SCHEME 5 – BITTERNE RAIL BRIDGE WIDENING

OPTION 1 - TIDAL FLOW GANTRY SYSTEM

13.7.63 The proposed works are not envisaged to increase the impermeable area of the carriageway or change the existing drainage regime. There are therefore no predicted impacts associated with increased flood risk. The proposed works are also not predicted to have an impact on flood risk within this area.

13.7.64 A summary of risks identified in this high level assessment is provided in **Table 13-14** below.

Table 13-14 SS5 Option 1 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 1	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Neutral	Neutral
	People and property elsewhere	Increased surface water runoff	Neutral	Neutral
	People and property elsewhere	Impact to flood flow or storage	Neutral	Neutral

OPTION 2 - WIDEN THE EXISTING BRIDGE

13.7.65 This Option involves localised widening to the north of Bitterne Rail Bridge, resulting in land take. Amendments / realignments to the existing road network would be required. This would involve demolition of the existing carriageway for the new alignment and some additional land take of mainly vegetated areas. The bridge edge beams would need to be removed.

13.7.66 The proposed works will change the current alignment of the bridge but are not considered to cause any notable increase in the impermeable area of the road when compared to the existing situation. There will therefore be no notable increase in the rate and volume of surface water runoff that will enter the highway drainage system.

13.7.67 The proposed works are located within an area identified to be at risk of surface water flooding. However, as the A3024 is elevated above adjacent ground levels the road is not considered to be at risk. The structure could have a slight impact on the flow and storage of flood waters within this area, but given that an existing and similar structure is already present at this location, the resultant impact on surface water flood risk is considered negligible.

OPTION 3 - REPLACEMENT (WIDENING) OF EXISTING DECK

13.7.68 Option 3 is similar to Option 2, with no difference in highways alignment and land take. The potential impacts identified for Option 3 are considered to be similar as those identified for Option 2.

13.7.69 A summary of risks identified in this high level assessment is provided in **Table 13-15** below.

Table 13-15 SS5 Option 2 and 3 Risks Identified

Option	Receptor	Impact	Magnitude	Significance
Option 2 and 3	River Itchen, River Test / Southampton Water, River Hamble	Pollution risks	Neutral	Neutral
	Ordinary Watercourses	Pollution risks	Neutral	Neutral
	Groundwater Resources	Pollution risks	Neutral	Neutral
	People and property elsewhere	Increased surface water runoff	Neutral	Neutral
	People and property elsewhere	Impact to flood flow or storage	Negligble	Slight Adverse

ASSESSMENT OF DO MINIMUM/DO SOMETHING SCENARIOS

13.7.70 Consideration has been given to the Do Minimum and Do Something scenarios as described below.

DO MINIMUM – SMART MOTORWAYS WITHOUT SCHEME

13.7.71 A summary of identified likely impacts associated with the proposed development options as summarised in **Section 3.2**, and **Table 3-1** is provided in **Table 13-16** below, as informed by the assessment provided within this section of the ESR[443].

Table 13-16 Do Minimum – Identified Likely Impacts

Sub-Scheme	Option	Assessment
Sub-Scheme 1	N/A	No predicted significant impacts
Sub-Scheme 2	N/A	No predicted significant impacts
Sub-Scheme 3	N/A	No predicted significant impacts
Sub-Scheme 5	N/A	No predicted significant impacts

[443] Environmental Study Report

DO SOMETHING 1 OPTION

13.7.72 A summary of identified likely impacts associated with the proposed development options as summarised in **Section 3.2**, and **Table 3-1** is provided in **Table 13-17** below, as informed by the assessment provided within this section of the ESR.

Table 13-17 Do Something 1 – Identified Likely Impacts

Sub-Scheme	Option	Assessment
Sub-Scheme 1	Option 1	Potential slight adverse impact to flood risk during construction and operation to road users and people and property elsewhere associated with works in area identified to be at surface water flood risk to west of Junction 8. Potential slight adverse impact to flood risk during operation associated with increase in impermeable surface and increase in the rate and volume of surface water runoff.
Sub-Scheme 2	Level 3	Potential slight adverse impact to water quality within ordinary watercourses during construction phase due to proximity to watercourses to works. Potential slight adverse impact to flood risk during operation associated with increase in impermeable surface and increase in the rate and volume of surface water runoff.
Sub-Scheme 3	Option 3A	Potential slight adverse impact to water quality within River Itchen during construction phase due to proximity of river to works. Potential slight adverse impact to water quality within groundwater resources during construction phase due to potential for deep excavations and/or foundations. Potential slight adverse impact to flood risk during operation associated with increase in impermeable surface and increase in the rate and volume of surface water runoff. Potential slight adverse impact to flood risk during operation associated with works in Flood Zone 2 and potential to alter flood flow conveyance.
Sub-Scheme 5	Option 1	No predicted significant impacts.

DO SOMETHING 2 OPTION

13.7.73 A summary of identified likely impacts associated with the proposed development options as summarised in **Section 3.2**, and **Table 3-1** is provided in **Table 13-18** below, as informed by the assessment provided within this section of the ESR[444].

Table 13-18 Do Something 2 – Identified Likely Impacts

Sub-Scheme	Option	Assessment
Sub-Scheme 1	Option 1	Potential slight adverse impact to flood risk during construction and operation to road users and people and property elsewhere associated with works in area identified to be at surface water flood risk to west of Junction 8. Potential slight adverse impact to flood risk during operation associated with increase in impermeable surface and increase in the rate and volume of surface water runoff.
Sub-Scheme 2	Level 1	No predicted significant impacts.
Sub-Scheme 3	Option 3A	Potential slight adverse impact to water quality within River Itchen during construction phase due to proximity of river to works. Potential slight adverse impact to water quality within groundwater resources during construction phase due to potential for deep excavations and/or foundations.

[444] Environmental Study Report

Sub-Scheme	Option	Assessment
		Potential slight adverse impact to flood risk during operation associated with increase in impermeable surface and increase in the rate and volume of surface water runoff. Potential slight adverse impact to flood risk during operation associated with works in Flood Zone 2 and potential to alter flood flow conveyance.
Sub-Scheme 5	Option 1	No predicted significant impacts.

DO SOMETHING 3 – SUB-SCHEME 1 ONLY

13.7.74 A summary of identified likely impacts associated with the proposed development options as summarised in **Section 3.2**, and **Table 3-1** is provided in **Table 13-19** below, as informed by the assessment provided within this section of the ESR[445].

Table 13-19 Do Something 3 – Identified Likely Impacts

Sub-Scheme	Option	Assessment
Sub-Scheme 1	Option 1	Potential slight adverse impact to flood risk during construction and operation to road users and people and property elsewhere associated with works in area identified to be at surface water flood risk to west of Junction 8. Potential slight adverse impact to flood risk during operation associated with increase in impermeable surface and increase in the rate and volume of surface water runoff.
Sub-Scheme 2	N/A	No predicted significant impacts.
Sub-Scheme 3	N/A	No predicted significant impacts.
Sub-Scheme 5	N/A	No predicted significant impacts.

SUMMARY

13.7.75 The potential impacts of the sub-scheme Options on the water environment are summarised in **Table 13-20** below.

13.7.76 The most notable potential impact during the construction stage comprises an increase in spillages of fuels, lubricants, hydraulic fluids and cements, and the mobilisation of suspended solids. These impacts can be largely mitigated through the implementation of a robust CEMP[446]. A residual risk to surface water features, most notably the ordinary watercourses that pass beneath Sub-Scheme 2, will remain given the proximity of the works to these features.

13.7.77 The most notable potential impact during operation comprises a potential increase in flood risk associated with surface water runoff from new areas of hard-standing. It is anticipated that this will be mitigated through the provision of an appropriate drainage system that will be developed during the detailed design stage.

Table 13-20 Summary of Effects

Sub-schemes	Options	Construction Impacts	Operation Impacts
Sub-scheme 1: M27 Junction 8 and Windhover Roundabout	Option 1 : Localised Junction Widening	Slight Adverse	Slight Adverse
	Option 2 : Through-about to A3024 Bursledon	Slight Adverse	Slight Adverse

[445] Environmental Study Report
[446] Construction Environmental Management Plan

Sub-schemes	Options	Construction Impacts	Operation Impacts
Upgrades	Option 3 : Free-flow left-turn slip lanes at M27 Junction 8	Slight Adverse	Slight Adverse
	Option 4 : Through-about to A3025 Hamble Lane	Slight Adverse	Slight Adverse
	Option 5 : Tunnel under Windhover Roundabout	Slight Adverse	Slight Adverse
Sub-scheme 2: A3024 Eastern Access Corridor	Level 1: Signal control improvements	Neutral	Neutral
	Level 2: Junction and signal improvements	Neutral	Neutral
	Level 3: Dualling full A3024 corridor	Slight Adverse	Slight Adverse
Sub-scheme 3: Northam Rail Bridge Replacement	Option 1: New bridge / Refurbish existing	Slight Adverse	Slight Adverse
	Option 2: New bridge / Raise and refurbish existing	Slight Adverse	Slight Adverse
	Option 3A: New bridge / Demolish and replace existing - close subway	Slight Adverse	Slight Adverse
	Option 3B: New bridge / Demolish and replace existing - retain subway	Slight Adverse	Slight Adverse
Sub-scheme 5: Bittern Bridge Widening	Option 1: Tidal flow gantry system	Neutral	Neutral
	Option 2: Widening of existing bridge	Slight Adverse	Slight Adverse
	Option 3: Replacement (widening) of existing deck	Slight Adverse	Slight Adverse

13.8 INDICATION OF ANY DIFFICULTIES ENCOUNTERED

13.8.1 Little information is currently known regarding the capacity of the existing highway drainage system, provision of treatment or attenuation facilities, or the location of outfalls to the water environment. This will need to be investigated during the design of the Schemes and in consultation with the relevant authorities.

14 OUTLINE ENVIRONMENTAL MANAGEMENT PLAN

14.1.1 **Table 14-1** provides a summary of the environmental mitigation and management measures that will be required, based on the current level of understanding of the impacts of the overall scheme. At this stage generic measures are provided that are likely to be required for all of the design options currently being proposed. The specific detail of mitigation required will need to be revisited once an option has been selected and the impacts can be better understood.

Table 14-1 Outline Environmental Management Plan

Topic	Sensitive Receptors	Potential Impact	Management Measures	Time Frame
Air Quality	Local residents AQMA[447].	Nuisance caused by dust deposition during construction. Impact on human health from NO_x and PM_{10} emissions due to construction traffic causing congestion.	Best Practice Measures in a CEMP[448]. Traffic Management Plan.	Prior to Construction.
Cultural Heritage	Unknown buried assets.	Physical disturbance caused during the excavation of new roads, service trenches, topsoil stripping, landscaping features and drainage ponds.	Desk and field based archaeological Investigations to establish nature, extent and survival of any previously unrecorded buried archaeological remains.	Prior to Construction
	Heritage Assets.	Impact on historic setting.	High quality design Undertake Setting Assessment including Historical Landscape Assessment. Bitterne Rail Bridge and Northam Rail Bridge structures to be subject to a Historic England standard building investigation prior to demolition or structural alterations.	Prior to submission for approval.
Landscape	Residential properties within the visual envelope of	Deteriorated visual amenity due to loss of grass verge, scrub, and	During construction all existing tree, scrub, shrub and	Prior to submission for approval.

[447] Air Quality Management Area
[448] Construction Environmental Management Plan

Topic	Sensitive Receptors	Potential Impact	Management Measures	Time Frame
	the road. Impacts on Landscape and Townscape Character.	trees within the highway boundary, and for new structures being introduced to viewpoints. Noticeable damage to the existing landscape character as well as loss of elements within the highway boundary and adjoining residential properties	hedgerow planting within the highway estate would be retained wherever feasible and protected in accordance with BS5837:2012. Loss of tree, scrub and shrub cover should be substituted elsewhere within the highway boundary in the vicinity of the scheme. Construction working methods around tree roots should take account of arboricultural advice for the protection of all retained trees. High quality design.	
Ecology and Nature Conservation	Designated Sites (SAC, SPA, Ramsar, SSSI[449], LWS).	Habitat loss, fragmentation, degradation or disturbance.	Assessment of Impacts on European Sites. Undertake species surveys including bat survey. Consider designated sites in the scheme construction Traffic Management Plan	As part of an update to the ESR[450].
	Valued habitats including BAP[451] habitats, such as hedgerows.	Temporary disturbance or permanent loss of these habitats.	Option selection, design of structures, layouts, ecological management plan and aftercare plan.	As part of an update to the ESR.
	Protected species.	Loss of habitat, disturbance and direct harm.	Undertake Phase II species surveys e.g. bats and reptiles to determine the management measures required.	As part of an update to the ESR at later stage in design process to reduce likelihood of surveys going out-of-date.

[449] Sites of Special Scientific Interest
[450] Environmental Study Report
[451] Biodiversity Action Plan

Topic	Sensitive Receptors	Potential Impact	Management Measures	Time Frame
Geology and Soils	Geology and soils, construction workers and water resources.	Contamination, accidental spillage.	Best Practice measures in a CEMP.[452]	Prior to Construction.
	Buildings (buried concrete structures).	Damage to the structure due to chemical attack and degradation.	Ground Investigation.	During the development of the design.
Materials	Waste management infrastructure and sources of material resources.	Use of finite resources and the production of waste with limited management infrastructure capacity.	Outline SWMP[453] and detailed assessment of materials once the design option has been selected.	Prior to Construction.
Noise and Vibration	Residential receptors (including NIAs) recreational users, sensitive habitat and species.	Disturbance from construction phase or due to bringing road traffic noise closer to receptor.	BPM to minimise construction noise.	Prior to submitting for approval.
People and Communities	Motorised users of the road. NMUs - on-road and off-road routes	Altered views from the road Change in levels of driver stress. Reduction in NMU amenity and journey length.	View from the road for MT should not be further obstructed by new structure(s), and open views of the surrounding countryside should be retained. Signage and layout (in construction) should be clear to understand and avoid creating Route Uncertainty.	Prior to submitting for approval.
	Users of community facilities. Owners and users of private property.	Community severance. Loss of private assets.		
Road Drainage and the Water Environment	Floodplain.	Increased flood risk.	Prepare a FRA (PCF Stage 3) once option is decided upon. Best Practice Measures in a CEMP.	As part of an update to the ESR[454]. Prior to Construction.
	Surface and Groundwater Quality.	Deterioration in quality and quantity.		

[452] Construction Environmental Management Plan
[453] Site Waste Management Plan
[454] Environmental Study Report

15 CONCLUSION

15.1 KEY CONSTRAINTS ASSOCIATED WITH THE SCHEME

15.1.1 As this ESR[455] has been undertaken to support early design work all topics have been scoped into this assessment at this stage.

15.1.2 Key constraints (i.e. constraints identified as having Large or Major Adverse effects) associated with the scheme include the following:

CONSTRUCTION	OPERATIONAL
→ **Sub-scheme 1** ▪ Option 2, 4 and 5 ▪ Archaeology → **Sub-scheme 2** ▪ Level 3 ▪ Archaeology ▪ Communities → **Sub-scheme 3** ▪ All Options ▪ Archaeology ▪ Noise → **Sub-scheme 5** ▪ Options 2 and 3 ▪ Archaeology ▪ Setting of Built Heritage ▪ Materials ▪ Noise	→ **Sub-scheme 2** ▪ All Options ▪ Air Quality ▪ Level 3 ▪ Noise → **Sub-scheme 5** ▪ All Options ▪ Air Quality ▪ Options 2 and 3 ▪ Archaeology ▪ Setting of Built Heritage

15.2 SUMMARY OF THE POTENTIAL EFFECTS ASSOCIATED WITH EACH OPTION

15.2.1 A summary of Construction and Operational phase constraints is included in **Table 15-1** and **Table 15-2**

[455] Environmental Study Report

Table 15-1 Summary of Construction Impacts

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
SS1	Opt1	Negligible	Archaeology – Negligible Setting of Build Heritage - Negligible	Landscape - Slight Adverse Visual - Moderate Adverse	Semi-natural broadleaved woodland in Windhover Roundabout and by M27 Junction 8 - significant at Site level (ST), No significant effect (LT) Intact species poor hedgerow by M27 Junction 8 and Windhover Roundabout - significant at Site level (ST), No significant effect (LT) No significant effect on the following: • Invertebrates • Badger • Dormouse • Bats roosting • Bats foraging • Breeding birds • Great crested newt • Reptiles • Hedgehog • Japanese knotweed • Trees subject to TPO[456]	Soil etc. (1) - Neutral or Slight Adverse Geology etc. (2) - Neutral	Neutral or Slight Adverse	Negligible and Moderate Adverse	Effects on All Travellers – No Change to Temporary Adverse Effects on Communities – No Change Effects on People – Slight Beneficial	Neutral to Slight Adverse
	Opt2	Negligible	Archaeology - Moderate/Large Adverse Setting of	Landscape - Moderate Adverse Visual -	Semi-natural broadleaved woodland in Windhover Roundabout and by M27 Junction 8 - significant at Site level (ST), No significant effect (LT) Intact species poor hedgerow by M27 Junction 8	Soil etc. (1) - Neutral or Slight Adverse	Slight Adverse	Negligible and Moderate Adverse	Effects on All Travellers – No Change - Moderate Adverse	Neutral to Slight Adverse

[456] Tree Preservation Order

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
			Built Heritage - Negligible	Moderate Adverse	and Windhover Roundabout - significant at Site level (ST), No significant effect (LT) No significant effect on the following: • Invertebrates • Badger • Dormouse • Bats roosting • Bats foraging • Breeding birds • Great crested newt • Reptiles • Hedgehog • Japanese knotweed • Trees subject to TPO[457]	Geology etc. (2) - Neutral			Effects on Communities – No Change Effects on People – TBA	
	Opt3	Negligible	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape - Slight Adverse Visual - Moderate Adverse	Semi-natural broadleaved woodland in Windhover Roundabout and by M27 Junction 8 - significant at Site level (ST), No significant effect (LT) Intact species poor hedgerow by M27 Junction 8 and Windhover Roundabout - significant at Site level (ST), No significant effect (LT) No significant effect on the following: • Invertebrates	Soil etc. (1) - Neutral or Slight Adverse Geology etc. (2) - Neutral	Slight Adverse	Negligible and Moderate Adverse	Effects on All Travellers – no change to Temporary Adverse Effects on Communities – No Change Effects on People – Slight	Neutral to Slight Adverse

[457] Tree Preservation Order

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
					• Badger • Dormouse • Bats roosting • Bats foraging • Breeding birds • Great crested newt • Reptiles • Hedgehog • Japanese knotweed • Trees subject to TPO[458]				Beneficial	
	Opt4	Negligible	Archaeology – Moderate/Large Adverse Setting of Built Heritage - Negligible	Landscape - Moderate Adverse Visual - Moderate Adverse	Semi-natural broadleaved woodland in Windhover Roundabout and by M27 Junction 8 - significant at Site level (ST), No significant effect (LT) Intact species poor hedgerow by M27 Junction 8 and Windhover Roundabout - significant at Site level (ST), No significant effect (LT) No significant effect on the following: • Invertebrates • Badger • Dormouse • Bats roosting • Bats foraging • Breeding birds • Great crested newt	Soil etc. (1) - Neutral or Slight Adverse Geology etc. (2) - Neutral	Slight Adverse	Negligible and Moderate Adverse	Effects on All Travellers – No Change - Moderate Adverse Effects on Communities – No Change Effects on People – TBA	Neutral to Slight Adverse

[458] Tree Preservation Order

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
					• Reptiles • Hedgehog • Japanese knotweed • Trees subject to TPO[459]					
	Opt5	Minor Adverse	Archaeology – Moderate/Large Adverse Setting of Built Heritage - Negligible	Landscape - Moderate Adverse Visual - Moderate Adverse	Oakleigh Meadow SINC - Significant at Local level (ST), No significant effect (LT) Semi-natural broadleaved woodland in Windhover Roundabout and by M27 Junction 8 - significant at Site level (ST), No significant effect (LT) Intact species poor hedgerow by M27 Junction 8 and Windhover Roundabout - significant at Site level (ST), No significant effect (LT) No significant effect on the following: • Invertebrates • Badger • Dormouse • Bats roosting • Bats foraging • Breeding birds • Great crested newt • Reptiles • Hedgehog • Japanese knotweed	Soil etc. (1) - Neutral or Slight Adverse Geology etc. (2) - Neutral	Moderate Adverse	Negligible and Moderate Adverse	Effects on All Travellers – No Change to Moderate Adverse Effects on Communities – No Change Effects on People – Slight Beneficial	Neutral to Slight Adverse

[459] Tree Preservation Order

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
					• Trees subject to TPO[460]					
SS2	Lv1	Negligible	Negligible	Landscape: Slight Visual: Slight Adverse	Solent and Southampton Water SPA[461] and Ramsar - No significant effect Millers Pond LNR[462] - No significant effect	NA	Neutral	Negligible	Effects on All Travellers – No Change Effects on Communities – No Change Effects on People – Beneficial Effect to Minor Adverse	Neutral
	Lv2	Negligible	Negligible	Landscape: Slight Visual: Slight Adverse	Solent and Southampton Water SPA and Ramsar -No significant effect Millers Pond LNR[463] - No significant effect Sholing Common SINC -significant at Local level (ST), No significant effect (LT)	NA	Neutral	Negligible and Moderate Adverse	Effects on All Travellers – No Change Effects on Communities – No Change Effects on People – beneficial effect to minor adverse	Neutral
	Lv3	Negligible	Archaeology –	Landscape – Moderate	Solent and Southampton Water SPA[464] and Ramsar -No significant effect	Soil - Neutral or Slight	Slight or Moderate	Negligible and	Effects on All Travellers –no	Neutral to Slight

[460] Tree Preservation Order
[461] Special Protection Areas
[462] Local Nature Reserve
[463] Local Nature Reserve

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
			Moderate/Large Adverse Setting of Built Heritage - Negligible	Adverse Visual - Moderate Adverse	Millers Pond LNR - No significant effect Sholing Common SINC -significant at Local level (ST), No significant effect (LT) Windhover (Netley Common South) SINC - significant at Local level (ST), No significant effect (LT) Shoreburs Greenway SINC - significant at Local level (ST), No significant effect (LT) Semi-natural broadleaved woodland - significant at Local level (ST), No significant effect (LT) Intact species poor hedgerow - significant at Local level (ST), No significant effect (LT) No significant effect on the following: • Invertebrates • Badger • Dormouse • Bats roosting • Bats foraging • Breeding birds • Great crested newt • Reptiles • Hedgehog	Adverse Remaining attributes (3) - Neutral	Adverse	Moderate Adverse	change to Minor Adverse Effects on Communities – Significant Adverse to Adverse Effects on People – Beneficial	Adverse

[464] Special Protection Areas

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
					• Trees subject to TPO[465]					
SS3	Opt1	Minor Adverse	Archaeology - Moderate/Large Adverse Setting of Built Heritage – Negligible	Landscape – Slight Adverse Visual - Slight Adverse	No significant effect on the following: • Bats roosting • Bats foraging • Breeding birds • Reptiles • Hedgehog	Groundwater and surface waters - Neutral or Slight Adverse Remaining attributes (4) - Neutral	Slight or Moderate Adverse	Negligible to Major Adverse	Effects on All Travellers – No Change to Minor Adverse Effects on Communities – Adverse effects Effects on People – Beneficial	Neutral to Slight Adverse
	Opt2	Minor Adverse	Archaeology - Moderate/Large Adverse Setting of Built Heritage – Negligible	Landscape – Moderate Adverse Visual – Moderate Adverse	No significant effect on the following: • Bats roosting • Bats foraging • Breeding birds • Reptiles • Hedgehog	Groundwater and surface waters - Neutral or Slight Adverse Remaining attributes (4) - Neutral	Moderate Adverse	Negligible to Major Adverse	Effects on All Travellers – No Change to Minor Adverse Effects on Communities – Adverse Effects Effects on People – Beneficial	Neutral to Slight Adverse
	Opt3A	Minor Adverse	Archaeology - Moderate/Large Adverse	Landscape – Moderate Adverse	No significant effect on the following: • Bats roosting • Bats foraging	Groundwater and surface waters - Neutral or	Moderate Adverse	Negligible to Major Adverse	Effects on All Travellers – No Change to Minor Adverse	Neutral to Slight Adverse

[465] Tree Preservation Order

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
			Setting – Negligible	Visual – Moderate Adverse	• Breeding birds • Reptiles • Hedgehog	Slight Adverse Remaining attributes (4) - Neutral			Effects on Communities – Adverse effects Effects on People – beneficial	
	Opt3B	Minor Adverse	Archaeology - Moderate/Large Adverse Setting – Negligible	Landscape – Moderate Adverse Visual – Moderate Adverse	No significant effect on the following: • Bats roosting • Bats foraging • Breeding birds • Reptiles • Hedgehog	Groundwater and surface waters - Neutral or Slight Adverse Remaining attributes (4) - Neutral	Moderate Adverse	Negligible to Major Adverse	Effects on All Travellers – No Change to Minor Adverse Effects on Communities – Adverse effects Effects on People – Beneficial	Neutral to Slight Adverse
SS5	Opt1	Negligible	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape – Slight Adverse Visual - Slight Adverse	Chessel Bay LNR[466] - No significant effect No significant effect on the following: • Bats roosting • Bats foraging • Reptiles • Breeding birds • Hedgehog • Japanese knotweed	All attributes (4) - Neutral	Neutral	Minor to Moderate Adverse	No change	Neutral

[466] Local Nature Reserve

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
	Opt2	Negligible	Archaeology - Large/Very Large Adverse Setting of Built Heritage – Moderate/Large Adverse	Landscape – Moderate Adverse Visual – Moderate Adverse	Chessel Bay LNR[467] - No significant effect No significant effect on the following: • Bats roosting • Bats foraging • Reptiles • Breeding birds • Hedgehog • Japanese knotweed	Groundwater and surface waters - Neutral or Slight Adverse Remaining attributes (4) - Neutral	Slight or Moderate Adverse	Moderate and Major Adverse	Effects on All Travellers – No Change Effects on Communities – No Change to Adverse effects Effects on People – Beneficial	Neutral to Slight Adverse
	Opt3	Negligible	Archaeology - Large/Very Large Adverse Setting of Built Heritage - Moderate/Large Adverse	Landscape – Moderate Adverse Visual – Moderate Adverse	Chessel Bay LNR - No significant effect Semi-natural broadleaved woodland - significant at Site level (ST), No significant effect (LT) No significant effect on the following: • Bats roosting • Bats foraging • Reptiles • Breeding birds • Hedgehog • Trees subject to TPO[468] • Japanese knotweed	Groundwater and surface waters - Neutral or Slight Adverse Remaining attributes (4) - Neutral	Moderate Adverse	Moderate and Major Adverse	Effects on All Travellers – No Change Effects on Communities – No Change to Adverse effects Effects on People – Beneficial	Neutral to Slight Adverse

[467] Local Nature Reserve
[468] Tree Preservation Order

Notes
(M) Assessed to Magnitude
(S) Assessed to Significance
(ST) Short Term
(LT) Long Term
(1) Soil groundwater and surface waters
(2) Geology and geomorphology, the built environment, construction workers and end users
(3) Groundwater, surface waters, geology and geomorphology, the built environment, construction workers and end users
(4) Soil, geology and geomorphology, the built environment, construction workers and end users

Table 15-2 Summary of Operational Impacts

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
SS1	Opt1	Minor Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Slight Adverse Visual: Slight Adverse	No significant effect	NA	NA	Negligible	Effects on All Travellers – Slight Beneficial Effects on Communities – No Change Effects on People – Slight Beneficial to Minor Adverse	Neutral to Slight Adverse
	Opt2	Minor Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Moderate Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Negligible	Effects on All Travellers – Beneficial to Adverse impact Effects on Communities – No Change Effects on People – Slight Beneficial to Minor Adverse	Neutral to Slight Adverse
	Opt3	Minor Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Slight Adverse Visual: Slight Adverse	No significant effect	NA	NA	Negligible	Effects on All Travellers – Slight Beneficial Effects on Communities – No Change Effects on People – Slight Beneficial to Minor Adverse	Neutral to Slight Adverse
	Opt4	Minor Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Moderate Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Negligible	Effects on All Travellers – Beneficial to Adverse impact Effects on Communities – No Change Effects on People – Slight Beneficial to Minor Adverse	Neutral to Slight Adverse
	Opt5	Minor Adverse	Archaeology – Negligible Setting of Built	Landscape: Slight Adverse Visual: Moderate	No significant effect	NA	NA	Negligible	Effects on All Travellers –Slight Beneficial Effects on Communities – No Change	Neutral to Slight Adverse

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
			Heritage - Negligible	Adverse					Effects on People – Slight Beneficial to Minor Adverse	
SS2	Lv1	Major Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Neutral Visual: Neutral	No significant effect	NA	NA	Negligible	Effects on All Travellers – Beneficial Effects on Communities – No Change	Negligible
	Lv2	Major Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Neutral Visual: Neutral	No significant effect	NA	NA	Negligible and Minor Adverse	Effects on All Travellers – Beneficial Effects on Communities – No Change	Negligible
	Lv3	Major Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Moderate Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Negligible to Major Adverse	Effects on All Travellers – slight beneficial to Minor Adverse Effects on Communities – No Change Effects on People – Beneficial to Minor Adverse	Neutral to Slight Adverse
SS3	Opt1	Minor Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Slight Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Minor and Moderate Adverse	Effects on All Travellers – Slight Beneficial Effects on Communities – No Change Effects on People – Beneficial to Minor Adverse	Neutral to Slight Adverse
	Opt2	Minor Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Slight Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Minor and Moderate Adverse	Effects on All Travellers – Slight Beneficial Effects on Communities – No Change Effects on People – Beneficial to Minor Adverse	Neutral to Slight Adverse

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
	Opt3A	Minor Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Slight Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Minor and moderate adverse	Effects on All Travellers – slight beneficial Effects on Communities – No change Effects on People – beneficial to minor adverse	Neutral to Slight Adverse
	Opt3B	Minor Adverse	Archaeology – Negligible Setting of Built Heritage - Negligible	Landscape: Slight Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Minor and Moderate Adverse	Effects on All Travellers – Slight Beneficial Effects on Communities – No Change Effects on People – Beneficial to Minor Adverse	Neutral to Slight Adverse
SS5	Opt1	Major Adverse	Archaeology - Negligible Setting Of Built Heritage - Negligible	Landscape: Neutral Visual: Neutral	No significant effect	NA	NA	Negligible	Beneficial	Neutral
	Opt2	Major Adverse	Archaeology - Large/Very Large Adverse Setting of Built Heritage - Moderate/Large Adverse	Landscape: Slight Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Minor Adverse Impacts	Effects on All Travellers – Slight Beneficial Effects on Communities – No Change to Adverse Effects on People – Beneficial - Minor Adverse	Neutral to Slight Adverse
	Opt3	Major Adverse	Archaeology - Large/Very Large Adverse Setting of Built Heritage -	Landscape: Slight Adverse Visual: Moderate Adverse	No significant effect	NA	NA	Minor Adverse impacts	Effects on All Travellers – Slight Beneficial Effects on Communities – No Change to Adverse	Neutral to Slight Adverse

Sub Scheme	Option or Level	Air Quality (M)	Cultural Heritage (S)	Landscape and Townscape (S)	Nature Conservation (S)	Geology and Soil (S)	Materials (S)	Noise (M)	People and Communities (S)	Road Drainage and Water (S)
			Moderate/Large Adverse						Effects on People – Beneficial - Minor Adverse	

Notes
(M) Assessed to Magnitude
(S) Assessed to Significance

Appendix A

SUB-SCHEME OPTIONS DRAWINGS

APPENDIX A-1

SUB-SCHEME 1 DRAWINGS

Appendix A1: Sub Scheme 1: M27 Junction 8 and Windhover Roundabout Drawings Key

Sub-scheme 1 Option	Description	Drawing Reference
Option 1	→ **Localised Junction Widening** ▪ **M27 Junction 8:** Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of Non-Motorised Users (NMU) facilities (including under M27 Junction 8). → **Windhover Roundabout:** Signalisation and localised widening at Windhover Roundabout, and implementation of Non-Motorised Users (NMU) facilities	**Sub-scheme 1: Junction 8 & Windhover Roundabout General Arrangement Option 1** → Sheet 1 of 2 - HE551514/WSP/HGN/M27/DR/D/10201/P01 → Sheet 2 of 2 - HE551514/WSP/HGN/M27/DR/D/10202/P01
Option 2	→ **Through-about to A3024 Bursledon** ▪ **M27 Junction 8:** Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of Non-Motorised Users (NMU) facilities (including under M27 Junction 8). ▪ **Windhover Roundabout:** Through-about lane across Windhover Roundabout linking A3024 Bursledon Road to A3024 Bert Betts Way and implementation of Non-Motorised Users (NMU) facilities.	**Sub-scheme 1 Junction 8 & Windhover Roundabout General Arrangement Option 2** → Sheet 1 of 2 - HE551514/WSP/HGN/M27/DR/D/10205/P01 → Sheet 2 of 2 - HE551514/WSP/HGN/M27/DR/D/10206/P01 **Sub-scheme 1 Junction 8 & Windhover Roundabout Ancillary Items - Option 2** → Sheet 1 of 2 HE551514/WSP/HGN/M27/DR/D/10505/P01 → Sheet 2 of 2 HE551514/WSP/HGN/M27/DR/D/10506/P01 **Sub-scheme 1 Junction 8 & Windhover Roundabout land Ownership Plan - Option 2** → Sheet 1 of 1 - HE551514/WSP/HGN/M27/DR/D/10402/P01 **Sub-scheme 1 Junction 8 & Windhover Roundabout Existing Utility Information - Option 2** → Sheet 1 of 2 - HE551514/WSP/HGN/M27 DR/D/10303/P01 → Sheet 2 of 2 - HE551514/WSP/HGN/M27 DR/D/10304/P01

Sub-scheme 1 Option	Description	Drawing Reference
Option 3	→ **Free-flow Left-turn Slip Lanes at M27Junction 8** ▪ **M27 Junction 8:** Dedicated left turning slip-lanes on all approaches. ▪ **Windhover Roundabout:** Signalisation and localised widening at Windhover Roundabout, and implementation of Non-Motorised Users (NMU) facilities.	**Sub-Scheme 1 Junction 8 & Windhover Roundabout General Arrangement - Option 3** → Sheet 1 of 2 - HE551514/WSP/HGN/M27/DR/D/10207/P01 → Sheet 2 of 2 - HE551514/WSP/HGN/M27/DR/D/10208/P01 **Sub-scheme 1 Junction 8 & Windhover Roundabout Ancillary Items - Option 3** → Sheet 1 of 2 - HE551514/WSP/HGN/M27/DR/D/10507/P01 → Sheet 2 of 2 - HE551514/WSP/HGN/M27/DR/D/10508/P01 **Sub-scheme 1 Junction 8 & Windhover Roundabout Land Ownership Plan - Option 3** → Sheet 1 of 1 - HE551514/WSP/HGN/M27/DR/D/10403/P01 **Sub-scheme 1 Windhover Roundabout Existing Utility Information - Option 3** → Sheet 1 of 2 - HE551514/WSP/HGN/M27/DR/D/10305/P01 → Sheet 2 of 2 - HE551514/WSP/HGN/M27/DR/D/10306/P01
Option 4	→ **Through-about to A3025 Hamble Lane** ▪ **M27 Junction 8:** Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of Non-Motorised Users (NMU) facilities (including under M27 Junction 8). ▪ **Windhover Roundabout:** Through-about lane across Windhover Roundabout linking A3025 Hamble Lane to A3024 Bert Betts Way and implementation of Non-Motorised Users (NMU) facilities.	**Sub-Scheme 1 Junction 8 & Windhover Roundabout General Arrangement - Option 4** → Sheet 1 of 1

Sub-scheme 1 Option	Description	Drawing Reference
Option 5	→ **Tunnel Under Windhover Roundabout** ▪ **M27 Junction 8:** Signalisation and localised widening on all approaches to the junction (including the on- and off-slips) and implementation of Non-Motorised Users (NMU) facilities (including under M27 Junction 8). ▪ **Windhover Roundabout:** Tunnel under Windhover Roundabout linking A3024 Bursledon Road to A3024 Bert Betts Way and implementation of Non-Motorised Users (NMU) facilities.	**Sub-scheme 1 Junction 8 & Windhover Roundabout General Arrangement Option 5** → Sheet 1 of 1 - HE551514/WSP/HGN/M27/DR/D/XXXXX/P01

Appendix A2: Sub-scheme 2: A3024 Eastern Access Corridor Level 3

Sub-scheme 2 Option	Description	Drawing Reference
A3024 Eastern Access Corridor	→ **Level 1 Signal control improvements** ▪ Urban Traffic Control (UTC) and traffic signal controller reconfiguration at signalised junctions to enable 'gap out' (GO) to eliminate running side roads for longer green times than required. Existing kerb lines and traffic signal infrastructure to be retained. No change to kerblines.	NA
	→ **Level 2 Junction and signal improvements** ▪ Removal of bus lanes between Windhover Roundabout and Six Dials Junction. Introduction of UTMC MOVA signal control at signalised junctions with ability to switch to UTC control if conditions require. Minor changes to kerblines at junctions (introducing flares and turning pockets) to improve localised stop-line capacity. ▪ Removal of bus lanes between Windhover Roundabout and Six Dials Junction.	**Sub-scheme 2 A3024 Bitterne Road General Arrangement - Level 2** → HE551514-SK-101 → HE551514-SK-102 → HE551514-SK-103 → HE551514-SK-104 → HE551514-SK-105 → HE551514-SK-106 → HE551514-SK-107 → HE551514-SK-108 → HE551514-SK-109 → HE551514-SK-110 → HE551514-SK-111 → HE551514-SK-112-B
	→ **Level 3 Dualling full A3024 corridor** ▪ As per Level 2, including changes to kerblines and carriageway widening to ensure 2 lanes per direction along the entire A3024 corridor	**Sub-scheme 2 A3024 Bitterne Road General Arrangement - Level 3** → Sheet 1 of 10 HE551514-WSP-HGN-M27-DR-D-20201/P01 → Sheet 2 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20202/P01 → Sheet 3 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20203/P01

Sub-scheme 2 Option	Description	Drawing Reference
	from Windhover Roundabout in the east to Six Dials junction in the west. ▪ Removal of bus lanes between Windhover Roundabout and Six Dials Junction.	→ Sheet 4 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20204/P01 → Sheet 5 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20205/P01 → Sheet 6 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20206/P01 → Sheet 7 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20207/P01 → Sheet 8 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20208/P01 → Sheet 9 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20209/P01 → Sheet 10 of 10 HE551514-WSP-HGN-M27-DR-D HE551514-WSP-HGN-M27-DR-D-20210/P01

APPENDIX A-2

SUB-SCHEME 3 DRAWINGS

Appendix A3: Sub-Scheme 3: Northam Rail Bridge Replacement

Sub-scheme 3 Option	Description	Drawing Reference
Option 1 – New Bridge / Refurbish Existing	→ Construct new two lane bridge and footpath cycleway on the north side of the existing bridge and strengthen the existing bridge to accept two lanes of unrestricted traffic. The headroom below the existing bridge does not meet current design standards.	**Sub-scheme 3 Northam Rail Bridge Option 1 General Arrangement** → Sheet 1 of 1 HE551514-WSP-HGN-M27-DR-D-30201/P01
Option 2 – New Bridge / Raise and Refurbish Existing Bridge	→ Construct new two lane bridge and footpath cycleway on the north side of the existing bridge and strengthen the existing bridge to accept two lanes of unrestricted traffic. The existing bridge is also to be raised to increase headroom above the tracks below	**Sub-scheme 3 Northam Rail Bridge Option 2 General Arrangement** → Sheet 1 of 1 - HE551514-WSP-HGN-M27-DR-D-30202/P01
Option 3 (A) – New Bridge / New Bridge	→ Construct new two lane bridge and footpath cycleway on the north side of the existing bridge and demolish and replace the existing structure - removing subway on eastern side of bridge and replacing with surface level crossing.	**Sub-scheme 3 Northam Rail Bridge Option 3A General Arrangement** → Sheet 1 of 1 HE551514-WSP-HGN-M27-DR-D-30203/P01
Option 3 (B) – New Bridge / New Bridge (Retained Subway)	→ Construct new two lane bridge and footpath cycleway on the north side of the existing bridge and demolish and replace the existing structure - retaining subway on eastern side of bridge.	**Sub-scheme 3 Northam Rail Bridge Option 3B General Arrangement** → Sheet 1 of 1 HE551514-WSP-HGN-M27-DR-D-30205/P01

APPENDIX A-3

SUB-SCHEME 5 DRAWINGS

Appendix A4: Sub-Scheme 5: Bittern Rail Bridge (Provision of 2-way Operation Across the Bridge)

Sub-scheme 5 Option	Description	Drawing Reference
Option 1 Tidal Flow System	→ Install tidal flow lane control system (no road or bridge widening)	**Sub-scheme 5 - Level 2 Junction ID020 Sheet Overview** → Sheet 12 of 12 - HE551514/SK/112/P01.2
Option 2: Widen the Existing Bridge	→ Widen the existing bridge to the north only by means of replacing the edge beams and cantilever of widened sections of existing deck.	***Note** – there is no difference in terms of highways alignment and land take impacts/requirements between Option 2 and Option 3.* **Sub-scheme 5 - Bitterne Bridge Existing Utility Information** → Sheet 1 of 1 - HE551514/WSP/HGN/M27/DR/D/50301/P01. **Sub-scheme 5 - Bitterne Bridge Land Ownership Plan** → Sheet 1 of 1 - HE551514/WSP/HGN/M27/DR/D/50401/P01
Option 3: Widen the Existing Bridge	→ Widen the existing bridge to the north only by means of replacing the existing deck with a new steel composite deck	

Appendix B

CULTURAL HERITAGE

APPENDIX B-1

GAZETEER OF HERITAGE ASSETS

Table 1 Known Below-ground/Surface Archaeological Remains Within the 200m Study Area of Sub-Scheme 2

HER Number	Name / Description	Historic Period
MSH5699	Site of Northam Marsh	Prehistoric (500,000BC to 43AD0 onwards
MSH5710	Site of Netley Branch Railway	Industrial (1750 to 1901)
MSH313	Bitterne Manor - Possible Site of Saxon Burh	Early Medieval (410 to 1066)
MSH298	Bitterne Manor - Saxon Inhumation Cemetery	Early Medieval (410 to 1066)
MSH3642	Site of grounds of Bitterne Manor House	Industrial (1750 to 1901)
MSH5200	Timber Pond and Timber Yard, north of Northam Bridge, River Itchen	Industrial (1750 to 1901)
MSH2947	Site of Middle Saxon town of Hamwic	Early Medieval (410 to 1066)
MSH5638	Site of tramway serving Northam Wharf	Industrial (1750 to 1901)
MSH1291	Marine Parade - site of Gas Works	Industrial (1750 to 1901)
MSH394	Bitterne - Suggested Routes of Roman Aqueducts	Romano-British (43AD to 410)
MSH4732	Chessel Estate Garden Suburb	Industrial (1750 to 1901)
MSH3641	Site of Chessel House	Industrial (1750 to 1901)
MSH2063	Derby Road - site of Saxon route and later country lane	Early Medieval (410 to 1066)
MSH2992	Corner of Bitterne Road West and Garfield Road - site of lodge to Chessel House	Industrial (1750 to 1901)
MSH5534	Site of Bull's Run railway line	Industrial (1750 to 1901)
MSH470	Possible Route of the Roman Road between Clausentum and Winchester	Romano-British (43AD to 410)
MSH550	Route of the Roman Road between Clausentum and Chichester	Romano-British (43AD to 410)
MSH453	Swaythling, Woodmill and Bitterne Park - Possible Route of Roman Road	Romano-British (43AD to 410)
MSH2678	Site of Southampton to Salisbury Canal	Industrial (1750 to 1901)
MSH504	Bitterne Manor House - Possible Garderobe	Industrial (1750 to 1901)
MSH2331	Englefield Road - Site of Shoreline	Undated
MSH2621	Land South of Quayside Road (Site of Scrap Yard) - Site of Marsh	Undated
MSH2450	Northam Community Centre - Site of Stream	Undated
MSH2643	Vespasian Road - Land Reclamation	Undated
MSH1420	Site/?remains of medieval "Chapel" at Bitterne Manor House	Early Medieval (410 to 1066)
MSH2592	St Mary's Road and its Middle Saxon precursor	Early Medieval (410 to 1066))
MSH1716	Bitterne Manor House Grounds - Remains of a Roman Bath House	Romano-British (43AD to 410)

Table 2 Known Below-ground/Surface Archaeological Remains in the 200m Study Area of Sub-scheme 3

HER Number	Name / Description	Historic Period
MSH2947	Site of Middle Saxon town of Hamwic	Industrial (1750 to 1901)
MSH1291	Marine Parade - site of Gas Works	Industrial (1750 to 1901)
MSH5699	Site of Northam Marsh	Industrial (1750 to 1901)
MSH2063	Derby Road - site of Saxon route and later country lane	Early Medieval (410 to 1066)
MSH5534	Site of Bull's Run railway line	Industrial (1750 to 1901)
MSH2678	Site of Southampton to Salisbury Canal	Industrial (1750 to 1901)
MSH2303	Northam Road Footbridge - Remains of Former Canal	Industrial (1750 to 1901)
MSH3053	100D and 100E St Mary Street - Middle Saxon Street	Industrial (1750 to 1901)
MSH1596	Six Dials - Middle Saxon Cemetery	Early Medieval (410 to 1066))
MSH1562	Six Dials - St Mary's Road and its Middle Saxon Precursor	Early Medieval (410 to 1066)
MSH4089	St Mary's Stadium site, Britannia Road/Marine Parade - Middle Saxon cemetery (8th century)	Early Medieval (410 to 1066)
MSH2288	Site of 79 - 100b St Mary Street and 79 Winton Street	Industrial (1750 to 1901)
MSH2450	Northam Community Centre - Site of Stream	Undated
MSH1859	The Site of 1 - 7 (odds) Ascupart Street	Industrial (1750 to 1901)

Table 3 Known Below-ground/Surface Archaeological Remains within the 200m Study Area of Sub-Scheme 5

HER Number	Name / Description	Historic Period
MSH5710	Site of Netley Branch Railway	Industrial (1750 to 1901)
MSH3642	Former grounds of Bitterne Manor House	Industrial (1750 to 1901)
MSH4732	Chessel Estate Garden Suburb	Industrial (1750 to 1901)
MSH3641	Grounds of the former Chessel House	Industrial (1750 to 1901)
MSH453	Swaythling, Woodmill and Bitterne Park - Possible Route of Roman Road	Romano-British (43AD to 410)
MSH1650	25 Vespasian Road - Boatyard and Land Reclamation	Industrial (1750 to 1901)
MSH550	Roman road between Clausentum and Chichester	Romano-British (43AD to 410)
MSH394	Bitterne - Suggested Routes of Roman Aqueducts	Romano-British (43AD to 410)

Appendix C

NOISE AND VIBRATION

APPENDIX C-1

GLOSSARY OF ACOUSTICS TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human hearing is able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used, which reduces the importance of lower and higher frequencies in a similar manner to human hearing.

The weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels found commonly in the environment is given in the table below.

Table A-1: Typical Sound Levels in the Environment

SOUND PRESSURE LEVEL, dB(A)	LOCATION
0	Threshold of hearing
20 to 30	Quiet bedroom at night
30 to 40	Living room during the day
40 to 50	Typical office
50 to 60	Inside a car
60 to 70	Typical high street
70 to 90	Inside factory
100 to 110	Burglar alarm at 1m away
110 to 130	Jet aircraft on take off
140	Threshold of pain

The subjective response to noise is dependent not only upon the sound pressure level and its frequency, but also its intermittency. Various indices have been developed to try and correlate annoyances with the noise level and its fluctuations.

- *Sound Pressure*: Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.

- *Sound Pressure Level (Sound Level)*: The sound level is the sound pressure relative to a standard reference pressure of 20 Pa ($20x10^{-6}$ Pascals) on a decibel scale.

- *Sound Power*: The sound energy radiated per unit time by a sound source. Measured in Watts (W).

- *Sound Power Level, L_W*: Sound power measured on a decibel scale, relative to a reference value of 10^{-12} W.

- *Decibel (dB)*: A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 $\log_{10}$ (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20 Pa.

- *A-weighting, dB(A)*: The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.

- *Noise Level Indices*: Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.

- $L_{eq,T}$: A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady noise that would contain the same amount of noise energy as the actual, possibly fluctuating, noise that was recorded.

- $L_{max,T}$: A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' SLM[469] response.

- $L_{90,T}$: A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.

- $L_{10,T}$: A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.

- $L_{night,outside}$: The A-weighted long-term average sound level outdoor determined over all night periods of a year. The night period is taken to be the eight hours between 23:00 and 07:00 hours. The sound level is the equivalent continuous sound level L_{eq}.

- *Free-Field*: Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m away.

- *Façade*: At a distance of 1m in front of a large sound reflecting object such as a building façade.

- *Slow and Fast Time Weightings*: Averaging times used in SLMs.

VIBRATION

Vibration is defined as a repetitive oscillatory motion. Groundborne vibration can be transmitted to the human body through the supporting surfaces and in most situations, entry into the human body will be through the supporting ground or through the supporting floors of a building. Vibration from road traffic can also be airborne. Such airborne vibration is transmitted as a low-frequency sound wave and is often perceived when the sound wave causes windows or other objects to rattle.

[469] Sound Level Meter

Vibration is often complex, containing many frequencies, occurring in many directions and changing over time. There are many factors that influence human response to vibration. Physical factors include vibration magnitude, vibration frequency, vibration axis, duration, point of entry into the human body and posture of the human body. Other factors include the exposed persons experience, expectation, and activity.

Experience shows that disturbance or annoyance from vibration in residential situations is likely to arise when the magnitude of vibration is only slightly in excess of the threshold of perception.

The threshold of perception depends on the frequency of vibration. The human body is most sensitive to vibration in the frequency range 1 to 80 Hz and especially sensitive to vibration in the range 4 to 8 Hz. As with noise, a frequency weighting mechanism is used to quantify vibration in a way that best corresponds to the frequency response of the human body. In general, vibration is only perceptible in residential situations when the building is close to a railway, construction site or very close to a road that carries large and heavy vehicles.

- *Displacement, Acceleration and Velocity; Root Mean Square (r.m.s.) and Peak Values; and Peak Particle Velocity (PPV)*: Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). When describing vibration, one must specify whether peak values are used (i.e. the maximum displacement or maximum velocity) or r.m.s. / r.m.q. values (effectively an average value) are used. Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV), whilst human response to vibration is often described in terms of r.m.s. or r.m.q. acceleration.

- *Root Mean Square (r.m.s.)*: The r.m.s. value of a set of numbers is the square root of the average of the squares of the numbers. For a sound or vibration waveform, the r.m.s. value over a given time period is the square root of the average value of the square of the waveform over that time period.

- *Root Mean Quad (r.m.q.)*: The r.m.q. value of a set of numbers is the fourth root of the average of the fourth powers of the numbers. For a vibration waveform, the r.m.q. value over a given time period is the fourth root of the average value of the fourth power of the waveform over that time period.

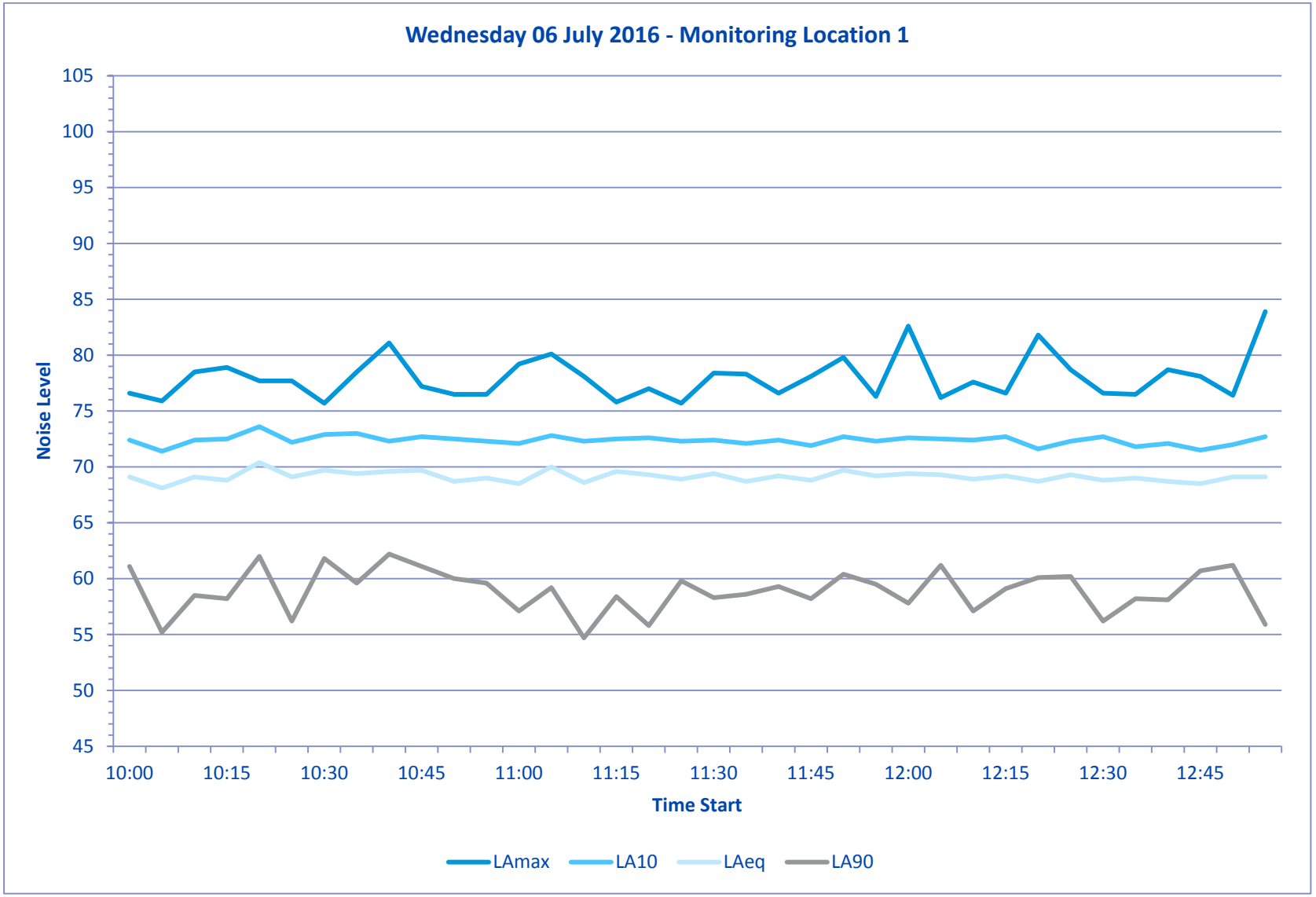
- *Attenuation*: A general term used to indicate the reduction of noise or vibration, or the amount (in decibels) by which it is reduced.

- *Vibration Dose Value (VDV)*: This is a measure of the amount of vibration that is experienced over a specified period, and has been defined so as to quantify the human response to vibration in terms of comfort and annoyance. The Vibration Dose Value is used to assess the likely levels of adverse comment about vibration, and is defined mathematically as the fourth root of the time integral of the fourth power of the acceleration, after it has been frequency weighted to take into account the frequency response of the human body to a vibration stimulus. Measured in units of $m\ s^{-1.75}$.

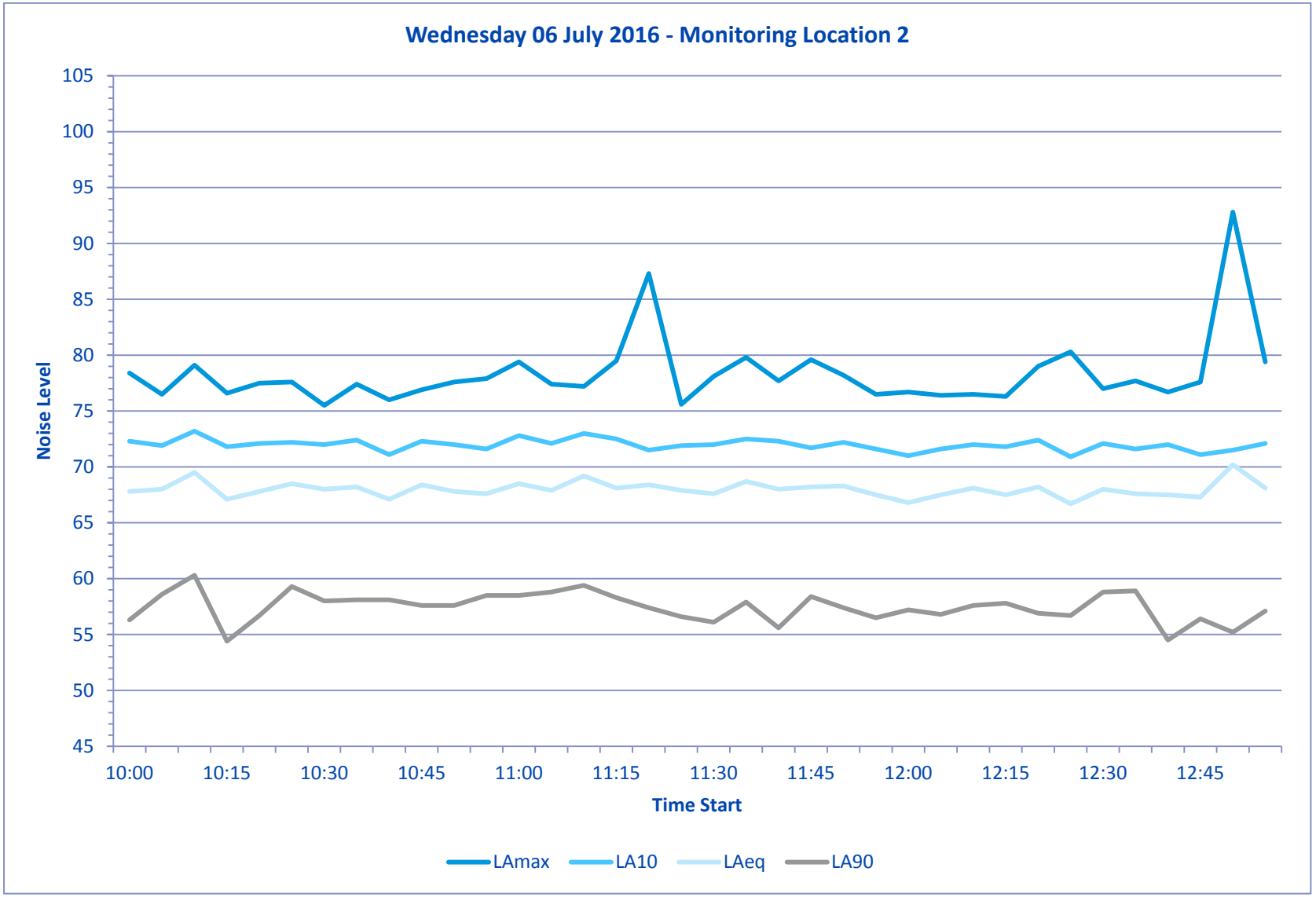
APPENDIX C-2

NOISE MONITORING TIME HISTORIES

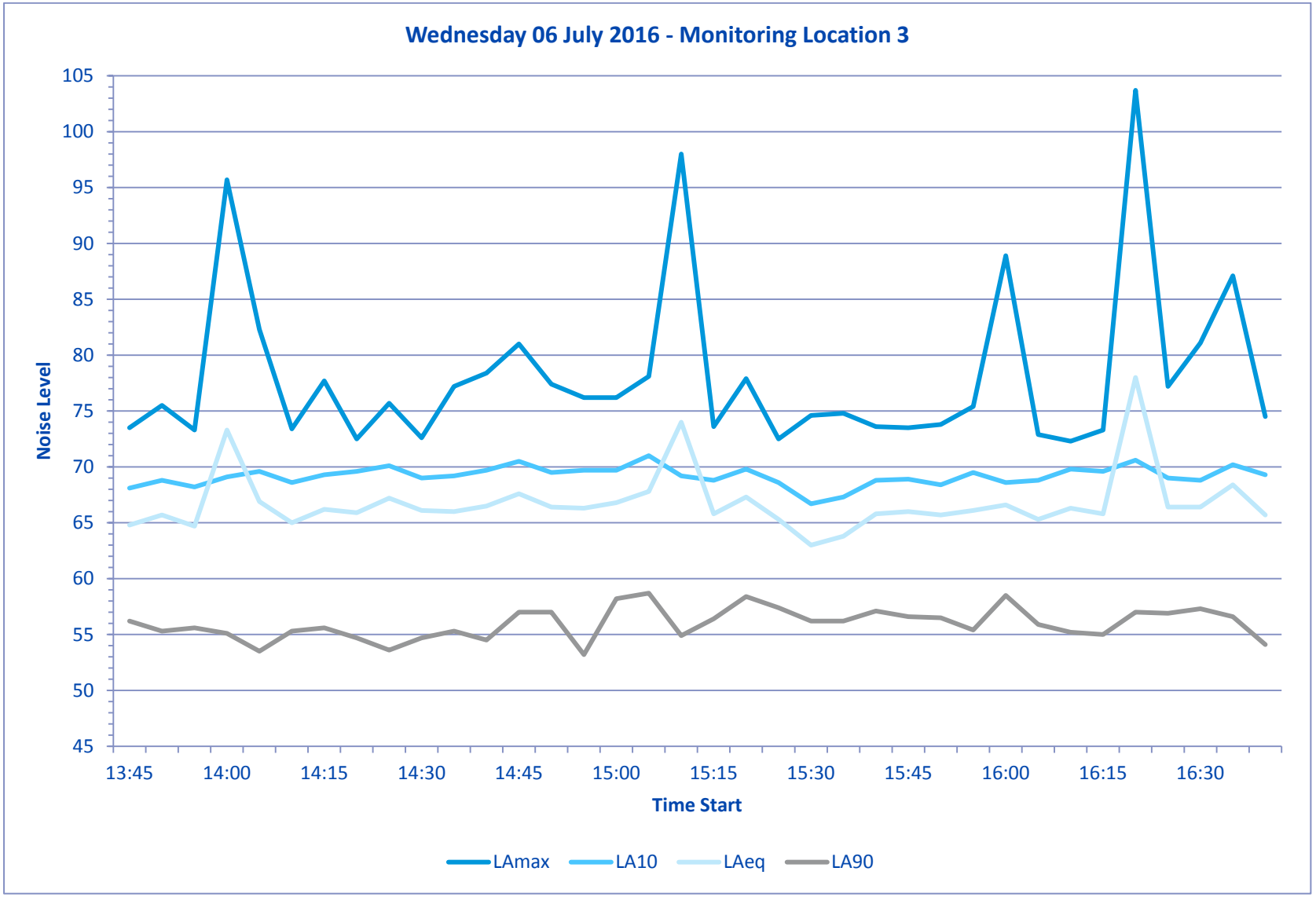
NOISE LEVEL TIME HISTORY – WEDNESDAY 06 JULY 2016 – MONITORING LOCATION 1



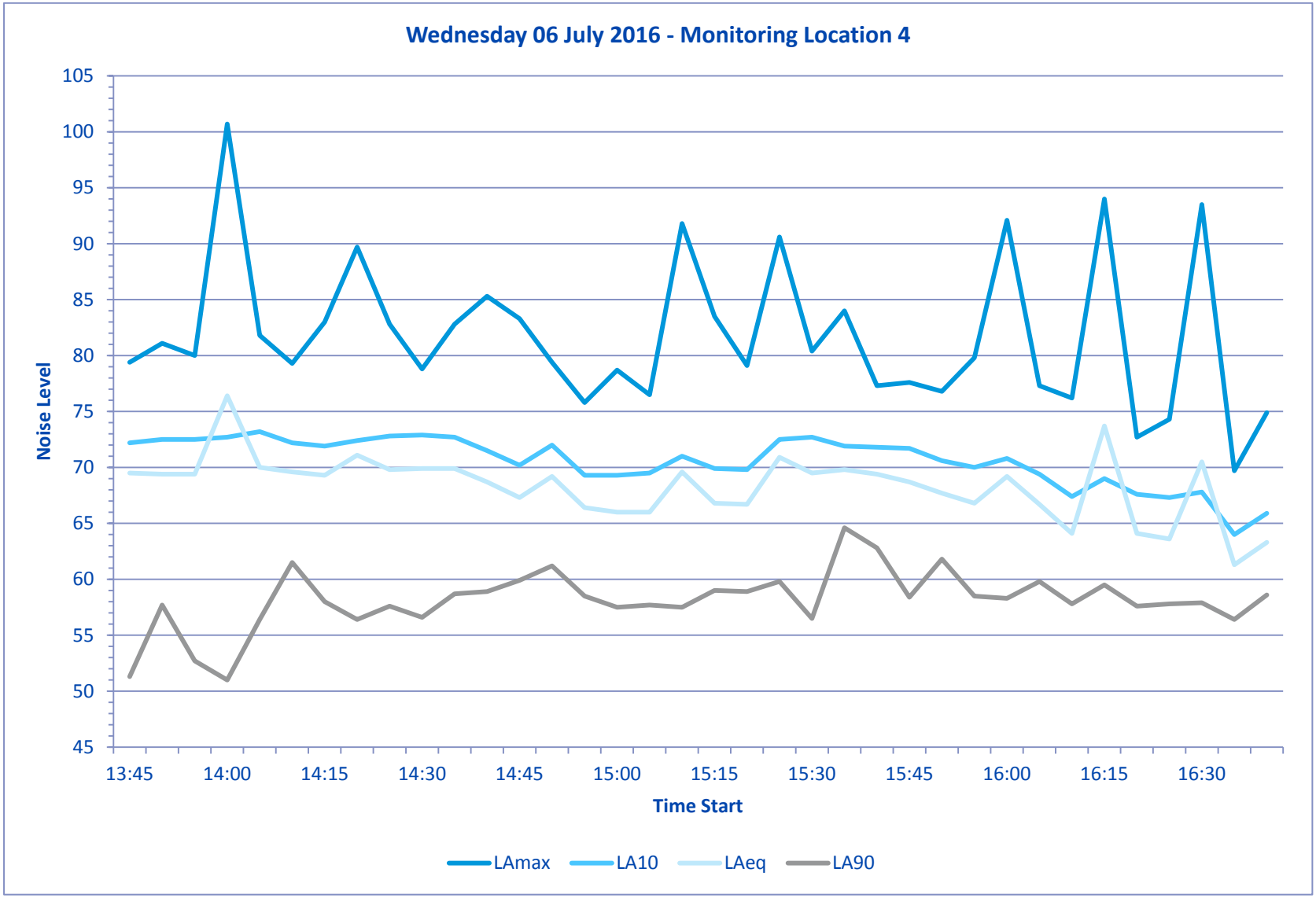
NOISE LEVEL TIME HISTORY – WEDNESDAY 06 JULY 2016 – MONITORING LOCATION 2



NOISE LEVEL TIME HISTORY – WEDNESDAY 06 JULY 2016 – MONITORING LOCATION 3



NOISE LEVEL TIME HISTORY – WEDNESDAY 06 JULY 2016 – MONITORING LOCATION 4



APPENDIX C-3

REGULATORY AND POLICY FRAMEWORK

NATIONAL PLANNING POLICY FRAMEWORK

The NPPF was published in March 2012 and is a key part of the reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

The NPPF consolidates national planning policy guidance into one document, which replaces the previous Planning Policy Statements (PPSs) and Planning Policy Guidance Notes.

The main reference to noise within the NPPF is at paragraph 123, which is reproduced below:

"123. Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts[27] on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts[27] on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;[28] and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The reference numbers 27 and 28 point respectively to the Explanatory Note to the Noise Policy Statement for England (NPSE) (see below) and the provisions of the EPA[470] 1990 and other relevant law.

NOISE POLICY STATEMENT FOR ENGLAND

The Noise Policy Statement for England (NPSE) was published in March 2010. The NPSE is the overarching statement of noise policy for England and applies to all forms of noise other than occupational noise, setting out the long term vision of Government noise policy which is to:

"Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

That vision is supported by the following aims which are reflected in the aims for planning policies and decisions in paragraph 123 of the NPPF:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

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[470] Environmental Protection Act

NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS, 2014

The NN NPS[471]) provides advice on the content of a noise assessment for EIA where a development is likely to result in significant noise impacts. It also requires, where appropriate, consideration of the potential for noise impacts that are directly associated with the proposed development, but occur outwith the immediate vicinity, such as changes in the road traffic movements elsewhere on the road network.

The NN NPS states that where a development is subject to an EIA and significant noise impacts are likely to arise, the applicant should include the following:

- a description of noise sources including likely usage (i.e. movements, fleet mix and diurnal pattern);
- identification of noise sensitive premises and noise sensitive areas that may be affected;
- characteristics of the existing noise environment;
- a prediction of how the noise environment will change with the proposed development;
- an assessment of the effect of predicted changes in the noise environment on any noise sensitive areas;
- mitigation measures, using best available techniques to reduce the noise impact; and
- the nature and extent of the noise assessment should be proportionate to the likely noise impact.

Operational noise with respect to humans should be assessed using the principles contained in relevant British Standards and other guidance. The prediction of road traffic noise should be undertaken using the Calculation of Road Traffic Noise (CRTN) (see below).

CONTROL OF POLLUTION ACT, 1974

Sections 60 and 61 of Part III of the CoPA[472] provide the local authority with certain powers for controlling noise and vibration arising from construction (and demolition) works, whether a statutory nuisance has been caused or is likely to be caused. These powers may be exercised either before works start or after they have started.

Section 60 enables a local authority to serve a notice of its requirements for the control of noise on the person who is, or will be, carrying out the work. Section 61 provides a mechanism for the person who will be carrying out the work to take the initiative and approach the local authority to ascertain its noise requirements before construction work starts. BPM[473] is defined in Section 72.

NOISE INSULATION REGULATIONS 1975, AS AMENDED 1988

[471] National Networks National Policy Statement (DfT, 2014); [online] available at: https://www.gov.uk/government/publications/national-policy-statement-for-national-networks
[472] Control of Pollution Act
[473] Best Practicable Means

The Noise Insulation Regulations (NIR) 1975, amended 1988, provide a framework for determining the entitlement to noise insulation treatment at eligible buildings (i.e. dwellings and other buildings used for residential purposes within 300m of the nearest point on the new or altered highway). The following three conditions should be met for the Regulations to apply:

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

The noise should be predicted using the CRTN (see below) at a reception point located 1m in front of the most exposed part of an external window or door of an eligible room. Traffic flows used in the calculations should be the maximum expected in a period of 15 years after opening to traffic. The predictions will be normally undertaken using the AAWT[474] flows.

ENVIRONMENTAL NOISE DIRECTIVE, 2002

EU Directive 2002/49/EC relates to the assessment and management of environmental noise, and it is normally referred to as the Environmental Noise Directive (END). It promotes the implementation of three steps:

- undertake strategic noise mapping to determine exposure to environmental noise;
- ensure information on environmental noise is made available to the public;
- establish Action Plans based on the strategic noise mapping results, to reduce environmental noise where necessary, and to preserve environmental noise quality where it is good.

The END has been transposed into UK law as the Environmental Noise (England) Regulations 2006 (as amended). As part of this process, noise mapping has been undertaken and NIAs have been identified.

CALCULATION OF ROAD TRAFFIC NOISE, 1988

This memorandum describes the procedures for calculating noise from road traffic. It provides a general method for predicting noise levels at a distance from a highway, taking into account different traffic parameters, intervening ground cover, road configuration and site layout. The procedures and requirements to be met during site measurements are detailed, together with details of a simplified measurement procedure which is acceptable in certain circumstances.

[474] Annual Average Weekday Traffic

DESIGN MANUAL FOR ROADS AND BRIDGES (DMRB) VOLUME 11, SECTION 3, PART 7, 2011 (HD213/11)

DMRB[475], Volume 11, Section 3, Part 7, Noise and Vibration (HD213/11) advises on the assessment of noise and vibration for road schemes.

The procedure for impact assessment involves three levels: a) Scoping, b) Simple and c) Detailed. Selecting the appropriate level of assessment depends on the following threshold criteria:

- permanent change in magnitude of 1 dB(A) in the short term (i.e. on opening);
- permanent change in magnitude of 3 dB(A) in the long term (i.e. between opening and future assessment years); and
- the predicted noise level during night-time $L_{night,outside}$ is greater than 55 dB in any scenario. The night-time noise level will be calculated in line with the methodology prepared by TRL[476].

The assessment is based upon the criteria for short-term and long-term noise impacts outlined in Tables 3.1 and 3.2 of HD213/11, as reproduced below. Based on these tables, a change in road traffic noise of 1 dB(A) in the short-term, when a scheme is opened, is the smallest considered perceptible. In the long-term, a 3 dB(A) change is considered perceptible.

Table A-2: DMRB Short-term Noise Impact

NOISE CHANGE, $L_{A10,18h}$	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 A-3: DMRB Long-term Noise Impact

NOISE CHANGE, $L_{A10,18h}$	MAGNITUDE OF IMPACT
0	No Change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0+	Major

BS 5228:2009+A1:2014

BS 5228-1:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*', provides recommendations for basic methods of noise control relating to construction and open sites where activities and operations generate significant noise levels. The annexes provide, amongst other things, information on the following:

- relevant legislation (annex A);

[475] Design Manual for Road and Bridges; [online] available at: http://www.standardsforhighways.co.uk/dmrb/
[476] Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping. TRL Limited. 2002.

- typical noise sources and advice on mitigating them (annex B);
- sound level data for use in the prediction methods described in the Standard (annex C and annex D);
- assessing the significance of noise effects (annex E);
- the estimation of noise levels (annex F); and
- how to implement noise monitoring (annex G).

Annex E provides a discussion on the different approaches to the assessment of construction noise, giving consideration to absolute noise criteria (in section E2) and to two different approaches to setting criteria based on the pre-construction ambient noise level (in section E3). One of these, the 'ABC' method, is presented in the table below (Table E.1 in the BS). Three categories, A, B and C are described in terms of threshold noise levels for a daytime (07:00 to 19:00 weekdays, 07:00 to 1:00 Saturday), evening and weekend, and finally a night time period (23:00 to 07:00). If the construction noise level exceeds the relevant threshold level this is deemed a "*significant effect*".

BS 5228-2:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*' is a companion standard for Part 1, providing recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels. Amongst other things, the annexes provide information on the following:

- relevant legislation (annex A);
- assessing the significance of vibration effects (annex B);
- measured vibration levels for piling (annexes C and D); and
- the prediction of vibration levels (annex E).

Table A-4: Assessment Category and Threshold Value

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD	THRESHOLD VALUE, IN DECIBELS (dB $L_{Aeq,T}$)		
	CATEGORY A [A)]	CATEGORY B [B)]	CATEGORY C [C)]
Night-time (23:00 − 07:00)	45	50	55
Evenings and weekends [D)]	55	60	65
Daytime (07:00 − 19:00) and Saturdays (07:00 − 13:00)	65	70	75

NOTE 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the periods increases by more than 3 dB due to site noise.

NOTE 3 Applied to residential receptors only.

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

D) 19:00–23:00 weekdays, 13:00–23:00 Saturdays and 07:00–23:00 Sundays.

APPENDIX C-4

CONSTRUCTION PHASE NOISE CONTROL

During the construction phase, it is recommended that the Contractor should apply BPM to minimise any residual noise impact. General methods of noise control include:

- The appropriate selection of plant, construction methods and programming. Only plant conforming with or better than relevant national or international standards, directives or recommendations on noise or vibration emissions will be used. Construction plant will be maintained in good condition with regard to minimising noise output and workers exposure to harmful noise and vibration;

- Construction plant will be operated and maintained appropriately, having regard to the manufacturer's written recommendations. All vehicles and plant will be switched off when not in use;

- The positioning of construction plant and activities to minimise noise at sensitive locations. Also, the design and use of site hoardings and screens to provide acoustic screening at the earliest opportunity;

- Choice of routes and programming for the transport of construction materials, spoil and personnel to reduce the risk of increased noise and vibration impacts due to the construction of the Scheme;

- Vehicles and mechanical plant used for the purposes of the works should be fitted with effective exhaust silencers, be maintained in good working order and operated in such a manner as to minimise noise emissions. Only plant items that comply with the relevant EU/UK noise limits applicable to that equipment will be used;

- Equipment that breaks concrete by munching or similar, rather than by percussion, will be used as far as is practicable;

- The use of mufflers on pneumatic tools;

- Where practicable, rotary drills actuated by hydraulic or electrical power should be used for excavating hard materials; and

- The use of non-reciprocating construction plant wherever practicable.

APPENDIX C-5

OPERATIONAL ROAD TRAFFIC NOISE CONTROL

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

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

The measures set out in the first two bullet points above should always be the primary objective when determining the vertical and horizontal alignment of the new and/or altered roads. However, it is acknowledged that it may not be possible to apply some of these techniques to this Scheme. For example, there may be good engineering, environmental or structural reasons why the route cannot be aligned further away from the nearest dwellings, or placed so as to maximise screening.

Environmental barriers can provide reductions of 10 dB or more for well-screened locations relatively close to the source. But at further distances and particularly where the barrier provides only a small deflection of the transmitted sound, actual reductions may only be 1 or 2 dB. Beyond 200-300m the effects are often zero as the attenuation of absorbent ground cover becomes a significant factor[477]. Other considerations with respect to barriers are:

- The primary objective of any barrier should be to prevent a direct line of sight between the receptor and the noise source;
- The higher the barrier, the greater the sound reduction, although, there will come a point where the additional benefit will not be cost-effective;
- The closer a barrier is to the source, the greater will be the sound reduction;
- Where a road is located on an embankment, the most efficient location for the barrier will usually be on the embankment as close to the edge of the carriageway as possible;
- Where a road is located in cutting, there will be less need for a barrier;
- A barrier will usually be less effective at screening upper floors of sensitive buildings; and
- Unless they are specifically designed and constructed to prevent this, a barrier can reflect sound, increasing noise levels at certain receptors located opposite barriers.

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[477] The CRTN states (in paragraph 22.3) that "*the additional attenuation referred to as ground absorption….is ignored when calculating the effects of barriers since the near ground rays are obstructed. However, under certain circumstances (e.g. with low barriers erected on grassland) it is possible for these ground absorption effects to exceed the calculated screening provided by the barrier. The barrier will not raise the noise level in the screened zone, and in these circumstances the noise levels with and without the barrier should be calculated and the lower of the noise levels used*".

The benefits likely to accrue from a low noise road surface will vary according to traffic speed and the type and age of surface. HD213/11 notes that compared with a standard hot rolled asphalt surface, the maximum allowable surface correction that can be claimed from using a thin surfacing system would be -3.5 dB. Such a difference is significant in that to achieve a comparable reduction in noise by reducing traffic flow, for example, would require at least a halving of traffic. However, HD213/11 also advises that a low noise road surface is much less effective where traffic speeds are below 75 kph.

The reason for this is that a low noise surface will influence noise emissions from the interaction of tyres with the road surface. Where vehicle speeds are lower, noise from the engine, transmission and exhaust becomes more significant, therefore it would be cautious to claim less benefit from a thin surfacing system where vehicle speeds are less than 75 kph and the advice from HD213/11 (paragraph A4.27) is as follows: "*where the mean traffic speed is <75 km/hr, a -1 dB(A) surface correction should be applied to a low-noise surface…..Although it is likely that thin surfacing systems will provide more acoustic benefit at lower speeds, until further research is carried out to provide reliable estimates, it is advised that a qualitative statement highlighting the possible acoustic benefits is also included in the assessment*."

Vehicle speed and the proportion of heavy duty vehicles combine to form a correction that is applied to the noise level determined from the vehicle flow. Above about 40 kph, the higher the speed, and the higher the proportion of heavy duty vehicles, the greater will be the correction. This correction can be significant. For example, with 6% heavy duty vehicles, reducing vehicle speed from 80 kph to 64 kph (50 mph to 40 mph) would result in a 1.5 dB reduction in road traffic noise, all else remaining equal. This is equivalent to a reduction in overall flow approaching 30%.

APPENDIX C-6

BNL CALCULATIONS – DO SOMETHING 1

Table A-5: Do Something 1 – Links with a Predicted Increase in BNL

NO.	LINK ID	DESCRIPTION / LOCATION	ROAD TYPE	BNL CHANGE, dB(A)	
				SHORT	LONG
1	11511_11912 *	A3024 (Orpen Rd to A334)	2-way	+1.1	
2	11911_11912 *			+1.3	
3	12611_12717 *			+1.1	
4	15819_13811 *	A3024 west of Northam Rail Bridge		+1.1	
5	30511_31024	Windhover roundabout	1-way	+3.3	+4.0
6	30953_30933	M27 Junction 8, northbound off-slip		+1.2	
7	31012_31013	Windhover roundabout		+2.5	+3.3
8	31024_31010			+4.1	+4.7
9	31044_31046	M27 Junction 8, gyratory		+1.0	
10	32711_32712	M27 Junction 7, gyratory		+1.9	
11	35565_35546	M27 Junction 5, westbound off slip		+2.3	

Note:
* These are two-way links (e.g. Link no.1 includes traffic data for 11511_11912 and 11912_11511)

Table A-6: Do Something 1 – Links with a Predicted Decrease in BNL

NO.	LINK ID	DESCRIPTION / LOCATION	ROAD TYPE	BNL CHANGE, dB(A)	
				SHORT	LONG
12	16013_16212 *	A335 (Dukes Rd to St Mary's Rd)	2-way	-2.9	
13	16211_15817 *			-1.1	
14	16231_16211 *			-1.1	
15	30912_30935	M27 Junction 8, gyratory	1-way	-1.5	
16	31046_30912			-2.3	
17	35541_35517	M27 Junction 5, gyratory		-1.6	

Note:
* These are two-way links (e.g. Link no.12 includes traffic data for 16013_16212 and 16212_16013)

APPENDIX C-7

BNL CALCULATIONS – DO SOMETHING 2

Table A-7: Do Something 2 – Links with a Predicted Increase in BNL

NO.	LINK ID	DESCRIPTION / LOCATION	ROAD TYPE	BNL CHANGE, dB(A)	
				SHORT	LONG
1	30511_31024	Windhover roundabout	1-way	+3.1	+3.8
2	31012_31013			+1.9	
3	31024_31010			+3.8	+4.5
4	32711_32712	M27 J7, gyratory		+1.9	
5	35565_35546	M27 J5, westbound off slip		+1.8	

Table A-8: Do Something 2 – Links with a Predicted Decrease in BNL

NO.	LINK ID	DESCRIPTION / LOCATION	ROAD TYPE	BNL CHANGE, dB(A)	
				SHORT	LONG
6	30912_30935	M27 Junction 8, gyratory	1-way	-2.3	
7	31046_30912			-3.1	
8	35541_35517	M27 Junction 5, gyratory		-1.1	

APPENDIX C-8

BNL CALCULATIONS – DO SOMETHING 3

Table A-9: Do Something 3 – Links with a Predicted Increase in BNL

NO.	LINK ID	DESCRIPTION / LOCATION	ROAD TYPE	BNL CHANGE, dB(A)	
				SHORT	LONG
1	30511_31024	Windhover roundabout	1-way	+3.0	+3.7
2	31012_31013			+1.9	
3	31024_31010			+3.8	+4.5
4	32711_32712	M27 Junction 7, gyratory		+1.9	
5	35565_35546	M27 Junction 5, westbound off slip		+1.8	

Table A-10: Do Something 3 – Links with a Predicted Decrease in BNL

NO.	LINK ID	DESCRIPTION / LOCATION	ROAD TYPE	BNL CHANGE, dB(A)	
				SHORT	LONG
6	30912_30935	M27 Junction 8, gyratory	1-way	-2.3	
7	31046_30912			-3.1	
8	35541_35517	M27 Junction 5, gyratory		-1.1	

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