



P e l l F r i s c h m a n n

Hoo Highway Improvements

Environmental Impact Assessment Scoping Report

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Prepared for:

Medway Council

Gun Wharf
Dock Road
Chatham
ME4 4TR

Prepared by:

Pell Frischmann

Millars Three,
Southmill Road,
Hertfordshire
CM23 3DH



Pell Frischmann

Contents

Acronyms	1
1. Introduction	1
1.1. Overview and Project Status	1
1.2. Scoping Report Approach	1
1.3. Need for Infrastructure Improvements and the Wider Scheme Context	2
2. Proposed Scheme	6
2.1. Overview of all phases	6
2.2. Phase 1 – New Relief Road – Improvements to existing Highways including providing new slip roads to Higham Road junction, new overbridge, improvements to Islingham Farm Road and Woodfield Way	7
2.3. Phase 2 – New Relief Road - Proposed relief road from Upchat Roundabout to Main Road Hoo Roundabout. A228/Main Road Roundabout junction modification. New A228 roundabout and associated spur link road.	11
2.4. Phase 3 - Improvements to A228 Bell's Lane Roundabout and Dux Court Road (widening and link road)	18
2.5. Phase 4 - Improvements to Ropers Lane Roundabout and Modification to the Stoke Road roundabout to allow access to the new station	19
2.6. Phase 5 - Four Elms Roundabout.....	20
2.7. Phase 6: Wulfere Way and Sans Pareil Roundabout.....	22
2.8. Construction	24
2.9. Operation	24
2.10. Decommissioning	24
3. Key Legislation and Planning Policy	25
3.1. EIA Statutory Requirements and Guidance	25
3.2. Planning Policy Context.....	25
4. Proposed EIA Methodology.....	27
4.1. Approach to EIA	27
4.2. Approach to Assessment Scenarios	27
4.3. Assessment of Significant Effects.....	29
4.4. Approach to Design and Management Measures	32
4.5. Approach to Cumulative Effects	33
5. Air Quality	35
5.1. Scoping Baseline.....	35
5.2. Potential Impacts of the Proposed Scheme	41
5.3. Impacts to be Scoped Out	42
5.4. Proposed Assessment Methodology	42

5.5.	Assumptions and Limitations	49
5.6.	References	49
6.	Noise and Vibration.....	51
6.1.	Scoping Baseline.....	51
6.2.	Potential Impacts of the Proposed Scheme	56
6.3.	Impacts to be Scoped Out	57
6.4.	Proposed Assessment Methodology	57
6.5.	Assumptions and Limitations	64
6.6.	References	65
7.	Nature Conservation	66
7.1.	Scoping Baseline.....	66
7.2.	Potential Impacts of the Proposed Scheme	73
7.3.	Impacts to be Scoped Out	74
7.4.	Proposed EIA Methodology	75
7.5.	Assumptions and Limitations	78
7.6.	References	79
8.	Historic Environment	80
8.1.	Baseline Conditions.....	80
8.2.	Potential Impacts of the Proposed Scheme	84
8.3.	Impacts to be Scoped Out	85
8.4.	Proposed Assessment Methodology	85
8.5.	Assumptions and Limitations	88
8.6.	References	89
9.	Landscape and Visual.....	90
9.1.	Scoping Baseline.....	90
9.2.	Potential Impacts of the Proposed Scheme	98
9.3.	Impacts to be Scoped Out	99
9.4.	Proposed Assessment Methodology	99
9.5.	Assumptions and Limitations	105
9.6.	References	106
10.	Road Drainage and the Water Environment.....	107
10.1.	Scoping Baseline.....	107
10.2.	Potential Impacts of the Proposed Scheme	110
10.3.	Impacts to be Scoped Out	112
10.4.	Proposed Assessment Methodology	112
10.5.	Assumptions and Limitations	123
10.6.	References	123

11.	Climate	124
11.1.	Scoping Baseline.....	124
11.2.	Potential Impacts of the Proposed Scheme	126
11.3.	Impacts to be Scoped Out	129
11.4.	Proposed Assessment Methodology	130
11.5.	Assumptions and Limitations	133
11.6.	References	134
12.	Population and Human Health.....	135
12.1.	Scoping Baseline.....	135
12.2.	Potential Impacts of the Proposed Scheme	139
12.3.	Impacts to be Scoped Out	141
12.4.	Proposed Assessment Methodology	142
12.5.	Assumptions and Limitations	151
12.6.	References	151
13.	Material Assets and Waste	153
13.1.	Scoping Baseline.....	153
13.2.	Potential Impacts of the Proposed Scheme	155
13.3.	Impacts to be Scoped Out	158
13.4.	Proposed Assessment Methodology	159
13.5.	Assumptions and Limitations	163
13.6.	References	163
14.	Geology and Soils	165
14.1.	Scoping Baseline.....	165
14.2.	Potential Impacts of the Proposed Scheme	173
14.3.	Impacts to be Scoped Out	174
14.4.	Proposed Assessment Methodology	174
14.5.	Assumptions and Limitations	178
14.6.	References	178
15.	Other Environmental Considerations	179
15.1.	Traffic and Transport	179
15.2.	Major Accidents and Disasters	179
15.3.	Heat and Radiation.....	179
15.4.	Lighting	180
16.	Summary.....	181
16.1.	Summary of EIA Scoping	181
16.2.	Proposed Structure of the Environmental Statement	188
16.3.	Environmental Statement: Non-Technical Summary.....	189

Figures

Figure 1: Overview of the highway improvements route	3
Figure 2: Phase 1 Rail improvement scheme	4
Figure 3: SEMS Location Map	5
Figure 4: Location of the phases of the highways improvement	6
Figure 5: Phase 1 - Modifications to A289 including providing proposed slip roads to Higham Road Slip Road to Higham Road junction, new overbridge, improvements to Islington Farm Road and Woodfield Way	9
Figure 6: View A shows the widening of Islington Farm Road, realigned with Woodfield Way to provide improved traffic flow. View B shows the improvements along the existing Woodfield Way including the provision of several crossing points, and an adjacent shared footway cycleway facility.	10
Figure 7: Phase 2 - Proposed Relief Road from Upchat Roundabout to Chattenden Lane.....	12
Figure 8: Phase 2 – Shows the continuation of the relief road to the east	13
Figure 9: Phase 2 – Proposed A228/Main Road Roundabout junction modification	15
Figure 10: Phase 2 – Proposed associated spur link road.....	16
Figure 11: Phase 2 - Proposed A228 Roundabout and associated spur link road.	17
Figure 12: Phase 3 - Improvements to A228 Bells Lane Roundabout & Dux Court Road (widening and link road)	18
Figure 13: Phase 4 – Improvements to Ropers Lane Roundabout	19
Figure 14: Phase 4 - Proposed link to proposed railway station	20
Figure 15: Phase 5 – Four Elms Roundabout.....	21
Figure 16: Phase 6 - Wulfere Way	22
Figure 17: Phase 6 - Sans Pareil Roundabout	23
Figure 18: Location of Air Quality Management Areas within the Medway Council Area	36
Figure 19: Location of the Gravesham A2 Air Quality Management Area.....	37
Figure 20: Air Quality Monitoring Sites within the Medway Council Area	37
Figure 21: Air Quality Monitoring Sites Close to the Study Area.....	38
Figure 22: Habitat Sites Close to the Road Improvement Scheme	41
Figure 23: Noise monitoring locations published within the Bells Lane, Hoo Planning Application (ref: MC171884).....	52
Figure 24: Noise monitoring locations published within the Ratcliffe Highway, Hoo St Werburgh Planning Application (ref.MC183663).....	54
Figure 25: Noise monitoring locations published within the Four Elms Hill, Chattenden Planning Application (ref.MC183245).....	55
Figure 26: Conservation Area Location Map	91
Figure 27: Extract of Agricultural Land Classification map for London and the South East (ALC007)	138

Tables

Table 1: How the future baseline is likely to be considered within topic chapters	28
Table 2: Criteria for assessing environmental value (sensitivity).....	30
Table 3: Criteria for assessing magnitude of impacts	30
Table 4: Significance matrix	31
Table 5: Measured Concentrations of NO ₂ at Medway Council's Automatic Monitoring Sites.....	38
Table 6: Measured Concentrations of NO ₂ at Diffusion Tubes Sites Close to the Proposed Scheme.....	39
Table 7: Measured Concentrations of PM ₁₀ at Medway Council's Automatic Monitoring Sites.....	39
Table 8: Measured Concentrations of PM _{2.5} at Medway Council's Automatic Monitoring Sites	40
Table 9: Potential Dust Magnitude	44
Table 10: Air Quality Impact Descriptor for Individual Receptors	48
Table 11: Summary of Measured Environmental Sound Survey Results at Bells Lane, Hoo ..	52
Table 12: Average Daytime and Night-time Noise Levels for Land off Ratcliffe Highway.....	54
Table 13: Construction Noise (Fixed and Mobile Plant) – ‘ABC Method’ Noise Thresholds	59
Table 14: Thresholds of Potential Effect Criteria (outdoor, free-field noise levels unless otherwise stated).....	60
Table 15: Noise Level Categories	60
Table 16: Vibration limits for human response and building (cosmetic) damage.....	61
Table 17: Road Traffic Noise – UAEL Threshold Derivation	62
Table 18: Road Traffic Noise Thresholds of Potential Effect Criteria (outdoor, free-field noise levels unless otherwise stated)	63
Table 19: Noise Level Categories	63
Table 20: Change in Noise Level Categories	64
Table 21: Change in Noise Level Categories	64
Table 22: Findings of Protected Species Surveys	70
Table 23: Criteria for assessing asset value in the assessment of Nature Conservation	76
Table 24: Typical descriptors of Impacts	77
Table 25: Criteria for assessing effect significance in the assessment of Nature Conservation	78
Table 26: Identified Listed Buildings within 1km of the Application Site	81
Table 27: Criteria for assessing asset value in historic environment assessment.....	87
Table 28: Criteria for assessing impact magnitude in historic environment assessment.....	87
Table 29: Criteria for assessing effect significance in historic environment assessment.....	88
Table 30: Criteria for assessing asset value in respect of the Landscape Resource	101
Table 31: Criteria for assessing impact magnitude in respect of the Landscape Resource...	102
Table 32: Criteria for assessing effect significance in respect of the Landscape Resource ..	102

Table 33: Criteria for assessing asset value in respect of Visual Effects	103
Table 34: Criteria for assessing impact magnitude in respect of Visual Effects	104
Table 35: Criteria for assessing effect significance in respect of Visual Effects	105
Table 36: Criteria for estimating the importance of water environment attributes.....	115
Table 37: Criteria for estimating the magnitude of an impact on an attribute (reproduction of Table 3.71 published in DMRB guidance document LA113).....	119
Table 38: Vulnerability of the Proposed Scheme to Climate Change.....	125
Table 39: Sources of GHG emission data to be used in the GHG assessment (adapted from Table 3.11.1 published in DMRB guidance document LA113).....	130
Table 40: Likelihood categories for climate vulnerability assessments (reproduction of Table 3.39a published in DMRB guidance document LA113)	132
Table 41: Measure of consequence for climate resilience assessments (reproduction of Table 3.39b published in DMRB guidance document LA113)	133
Table 42: Climate Resilience Significance Matrix	133
Table 43: ONS Data for Employee Jobs by Industry for 2018	136
Table 44: Receptor value (sensitivity) descriptors for Land Use and Accessibility assessments	145
Table 45: Impact magnitude descriptors for Land Use and Accessibility assessments.....	148
Table 46: Published figures for construction materials	153
Table 47: Recovery rate from non-hazardous construction and demolition waste for England, 2010-16.....	154
Table 48: Remaining landfill capacity for the South East region	155
Table 49: Criteria for assessing the sensitivity of materials and waste (reproduced from guidance presented in Section 10.2 of IEMA Materials and Waste in EIA guidance document)	160
Table 50: Criteria for assessing impact magnitude for materials and waste (reproduced from guidance presented in Section 10.3 of IEMA Materials and Waste in EIA guidance document)	162
Table 51: Criteria for assessing asset value in the Geology and Soils impact assessment...	175
Table 52: Criteria for assessing impact magnitude in the Geology and Soils impact assessment	176
Table 53: EIA Summary	181

Appendices

Appendix A - Environmental Constraints Plans

Appendix B - Ecological Assessment Reports

Acronyms

Abbreviation	Definition
µg	Microgram/ micron
AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling System
AEP	Annual Exceedance Probability
ALC	Agricultural Land Classification
AOD	Above Ordnance Datum
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AQO	Air Quality Objective
ASR	Annual Status Report
ASSI	Area of Special Scientific Interest
AURN	Automatic Urban and Rural Network
BAP	Biodiversity Action Plan
BGS	British Geological Survey
BOAT	Byways Open to All Traffic
BoCC	Birds of Conservation Concern
BS	British Standard
CAMS	Catchment Abstraction Management Strategy
CCTV	Closed-circuit television
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
dB	Decibels
DCO	Development Consent Order
DDA	Disability Discrimination Act
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DS	Do Something
DT	Diffusion Tube
DTM	Digital Terrain Model
EA	Environment Agency
EclA	Ecological Impact Assessment
EFT	Emission Factor Toolkit
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EOD	Explosive Ordnance Disposal
EQS	Environmental Quality Standards

Abbreviation	Definition
ES	Environmental Statement
ESC	Environmental Sound Criteria
EU	European Union
FCS	Favourable Conservation Status
FRA	Flood Risk Assessment
GB	Great Britain
GBC	Gravesham Borough Council
GCN	Great Crested Newt
GCR	Geological Conservation Review
GHG	Greenhouse Gas
GLVIA3	Guidelines for Landscape and Visual Impact Assessment, 3 rd Edition
GRIP	Governance for Railway Investment Projects
GWDTE	Groundwater Dependent Terrestrial Ecosystems
ha	Hectare
HDV	Heavy Duty Vehicles
HER	Historic Environment Record
HEWRAT	Highways England Water Risk Assessment Tool
HGV	Heavy Goods Vehicle
HIF	Housing Infrastructure Fund
HM	Her Majesty's
Hz	Hertz
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
IMD	Indices of Multiple Deprivation
km	Kilometre
KMBRC	Kent and Medway Biological Records Centre
kph	Kilometres per hour
L _{Aeq}	Equivalent Continuous Sound Level
LAQM	Local Air Quality Management
LCA	Landscape Character Assessment
LDV	Light Duty Vehicle
LED	Light-emitting diode
LGF	Local Growth Fund
LGS	Local Geological Sites
LiDAR	Light Detection and Ranging
LOAEL	Lowest Observed Adverse Effect Level
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
m	Metre
m ³	Metres cubed
m/s	Metres per second

Abbreviation	Definition
MAGIC	Multi-Agency Geographic Information for the Countryside
Max.	Maximum
MCZ	Marine Conservation Zone
MHCLG	Ministry of Housing, Communities and Local Government
Min.	Minimum
MOD	Ministry of Defence
mph	Miles per hour
N/A	Not Applicable
NBN	National Biodiversity Network
NCA	National Character Area
NMR	National Monuments Record
NMU	Non-motorised User
NNR	National Nature Reserve
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NOMIS	National Online Manpower Information System
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
NRMM	Non-road Mobile Machinery
NVZ	Nitrate Vulnerable Zone
O ₃	Ozone
ONS	Office of National Statistics
OS	Ordnance Survey
PC	Process Contribution
PEA	Preliminary Ecological Appraisal
PM	Particulate Matter
PPG	Planning Practice Guidance
PPV	Peak Particle Velocity
PRA	Preliminary Risk Assessment
PRF	Potential Roosting Feature
PRoW	Public Rights of Way
RIGS	Regionally Important Geological Sites
RSME	Royal School of Military Engineering
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEMA	Strategic Environmental Management Area
SEMS	Strategic Environmental Management Scheme
SINC	Site of Nature Conservation Interest
SLAA	Strategic Land Availability Assessment
SLINC	Site of Local Importance for Nature Conservation
SNCI	Sites of Nature Conservation Importance

Abbreviation	Definition
SO ₂	Sulphur dioxide
SOAEL	Significant Observed Adverse Effect Level
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
tCO ₂ e	Tonnes of carbon dioxide equivalent
TG	Technical Guidance
TMP	Traffic Management Plan
UAEL	Unacceptable Adverse Effect Level
UK	United Kingdom
UKCP	United Kingdom Climate Projections
UNESCO	United National Educational, Scientific and Cultural Organization
UTLA	Upper-tier Local Authority
UXB	Unexploded Bomb
UXO	Unexploded Ordnance
VDV	Vibration Dose Value
WCH	Walkers, cyclists, and horse riders
WCHAR	Walkers, cyclists and horse riders Assessment and Review
WFD	Water Framework Directive
WHO	World Health Organisation
WPZ	Water Protection Zone
ZOI	Zone of Influence

1. Introduction

1.1. Overview and Project Status

- 1.1.1 Pell Frischmann has been commissioned by Medway Council ('the Applicant') to prepare a report in order to inform the Environmental Impact Assessment (EIA) Scoping process in respect of its proposals described in Chapter 2 ('the Proposed Scheme'). This report accompanies a request by the Applicant to the Medway Council for a Scoping Opinion in accordance with Regulation 15(1) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (hereafter referred to as the EIA Regulations).
- 1.1.2 This EIA Scoping Report relates to the proposed highway infrastructure improvements in response to the potential development of new homes on the Hoo Peninsula in Kent to the north of Chatham and the River Medway. The Proposed Scheme, which is described in full in Chapter 2, includes the improvement to the road network around the A228 between Chattenden and Sharnal Street.
- 1.1.3 A request for a formal Screening Opinion update Regulation 15(2) of the EIA Regulations, has not been made. Considering the size and extend of the Proposed Scheme, together with the potential for significant environmental effects, it is considered that Environmental Impact Assessment (EIA) will be required.

1.2. Scoping Report Approach

- 1.2.1 The purpose of this report is to present the relevant available information on the Proposed Scheme and propose the scope of the EIA. This document presents a summary of the available environmental information for the Proposed Scheme.
- 1.2.2 This report aims to satisfy Regulations 10(3) of the EIA Regulations which specifies that a request for a Scoping Opinion must include:
- (a) a plan sufficient to identify the land;
 - (b) a description of the proposed development, including its location and technical capacity;
 - (c) an explanation of the likely significant effects of the development on the environment; and
 - (d) such other information or representations as the person making the request may wish to provide or make.
- 1.2.3 Each of the environmental topic chapters presented within this report will aim to provide the Secretary of State with:
- A summary of the baseline environmental conditions at the site;

- An indication of the potential for the Proposed Scheme to result in environmental impacts, to be scoped into the EIA;
- A description of areas where the Proposed Scheme is unlikely to result in impacts, and a justification for scoping these elements out of the EIA.;
- The proposed assessment methodologies to be applied for the EIA, including anticipated study areas.

1.3. Need for Infrastructure Improvements and the Wider Scheme Context

- 1.3.1 The town of Hoo lies on the Hoo Peninsula in Kent to the north of Chatham and the River Medway. As part of the preparation of the new Local Plan for the area of Medway Council, the development strategy proposed is for large scale development on the Hoo Peninsula of approximately 10,600 homes. This has been discussed in the consultations on the Local Plan to date and will be set out in the consultation on the publication version of the Local Plan (under Regulation 19 of the Town and Country Planning (Local Planning) Regulations 2012) that is proposed to be carried out in the early part of 2021.
- 1.3.2 In order for housing development to be achievable and sustainable on the Hoo Peninsula without overloading existing infrastructure; infrastructure improvements are required, to deal with the increased population and demand on transport and environmental infrastructure on the Hoo Peninsula. The Proposed Scheme (to which this EIA Scoping Report relates), along with the corresponding reopening of the Grain Branch line and Strategic Ecological Mitigation Strategy (SEMS), has been proposed in direct response to this anticipation of increased demand and to enable development on the Hoo Peninsula to be brought forward.
- 1.3.3 The relationship between these different infrastructure improvements for EIA purposes is considered further in chapter 4 of this report.
- 1.3.4 The forward funding of the Proposed Scheme, railway works and the SEMS has been obtained through a successful Housing Infrastructure Fund (HIF) bid by the Applicant to Homes England.

Highway Improvements

- 1.3.5 The Proposed highway Improvement Scheme, to which this EIA Scoping Report relates, comprises planned upgrades to the existing road network that will also be required to facilitate the delivery of new homes on the Hoo Peninsula.
- 1.3.6 The Hoo peninsula is connected into the main highway network along Peninsula Way which is a dual carriageway road with multiple roundabouts. Traffic density at peak times mean the road and junctions are beyond capacity and further housing could make matters worse without improvements to the infrastructure.
- 1.3.7 It is proposed that highways improvement work, be focused on increasing the capacity around the A228 and the A289 between Wainscott and Sharnal Street. This is shown in Figure 1.

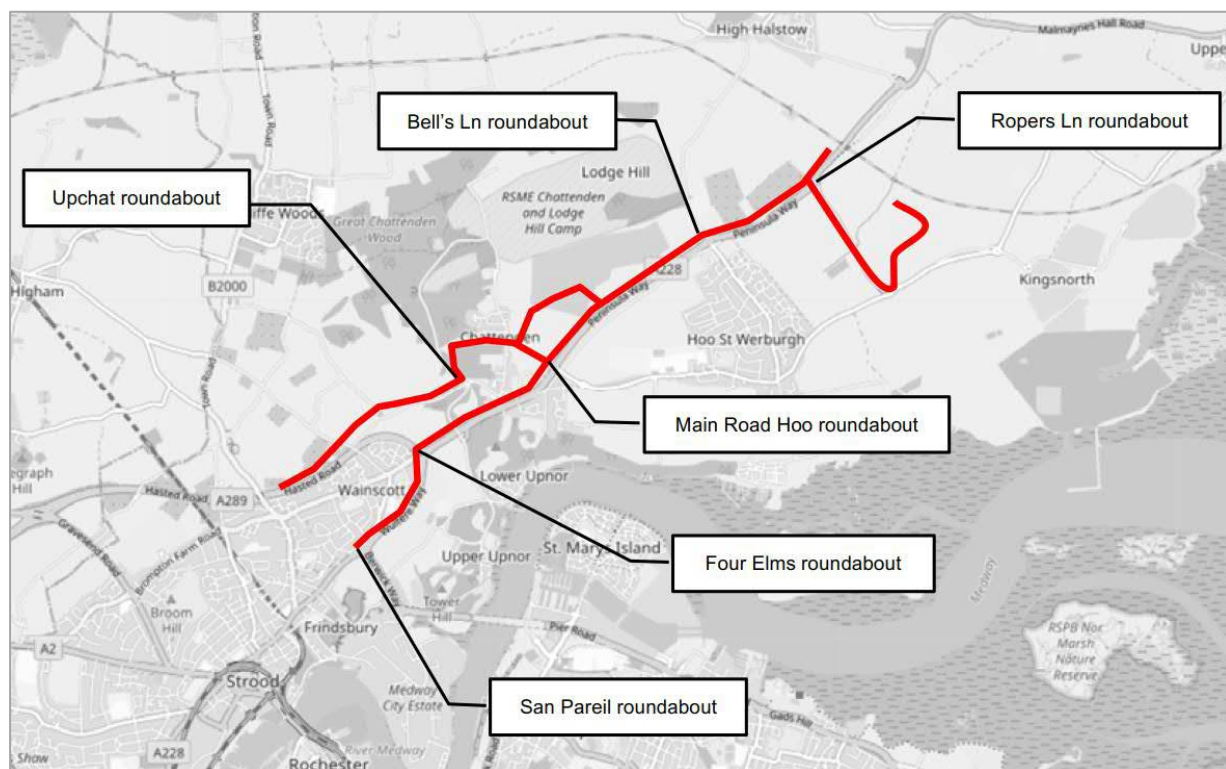


Figure 1: Overview of the highway improvements route

1.3.8 The highways improvements be undertaken over six phases comprising:

- Phase 1: Improvements around the A289 Wainscott;
- Phase 2: Development of a new relief road between Upchat Roundabout and Main Road Hoo Roundabout including a new roundabout on the A228;
- Phase 3: Modification of the existing Bells Lane Roundabout on the A228;
- Phase 4: Modification of Ropers Lane Roundabout on the A228 and a new station access;
- Phase 5: Modifications to increase road capacity on Four Elms Roundabout; and
- Phase 6: Modifications of Wulfere Way to Sans Pareil Roundabout.

Details of these six phases are presented in Chapter 2. For clarity, it can be confirmed that the reference to 'phases' above does not necessarily mean that the works will be constructed in that sequence.

Rail Improvements

1.3.9 In addition, to the proposed highway infrastructure improvements, rail infrastructure improvements are also proposed in order to achieve sufficient transport capacity for the delivery of a total of 10,600 new homes on the Hoo Peninsula.

- 1.3.10 The rail infrastructure improvements include the reinstatement of the existing railway line to passenger movements with the creation of a new station. The rail improvement work will be subject to a separate application for a Transport Works Act Order, and therefore does not form part of the Proposed Scheme to which this EIA Scoping Report relates.
- 1.3.11 A new station will relieve not only the demands of additional housing but also of the existing residents of the peninsula who may use the service as a main transport connection and take the last mile home by car, cycle or on foot.
- 1.3.12 It is envisaged that the reopening of the Grain Branch Line would be undertaken over 2 phases.
- Phase 1 would be completed by March 2024 and would include the improvements to the existing Grain rail line, the delivery of a modular station building and single station platform at Sharnal Street, serving the existing single track with an additional section of track, a drop-off area, carpark and public space used for pop-up retail and meanwhile uses. Phase 1 would also include a number of alterations to crossing points along the length of the route, including alterations to existing accesses, works to level crossings and public rights of way.
 - Phase 2 relates to future development of the branch line. This work would be undertaken post 2024 and could include a second platform serving a double track brought forward by more rail corridor improvements, a footbridge and two lifts linking the two platforms, a larger carpark and the development of the station into a destination such as a shopping and restaurant village. These works do not have funding or planning support at this time but will be provided for within the developing Local Plan.



Figure 2: Phase 1 Rail improvement scheme

Strategic Ecological Management Scheme

- 1.3.13 The SEMS is designed to holistically address ecological and other environmental issues, and opportunities, across the Hoo Peninsula in the context of large numbers of housing being brought forward in the years to come, particularly if sustainable development is to occur. Examples of environmental management that are being considered include habitat creation, increased awareness and education, choosing access routes to minimise impact to the coast or sensitive areas, and woodland, scrub, grassland and wetland management.

- 1.3.14 Twelve Strategic Environmental Management Areas (SEMA) have been chosen, mindful of where future housing developments are planned. The target date for completion of the SEMS project is estimated to be March 2024. The locations of the 12 SEMAs are presented in Figure 3. These would be brought forward through planning applications.

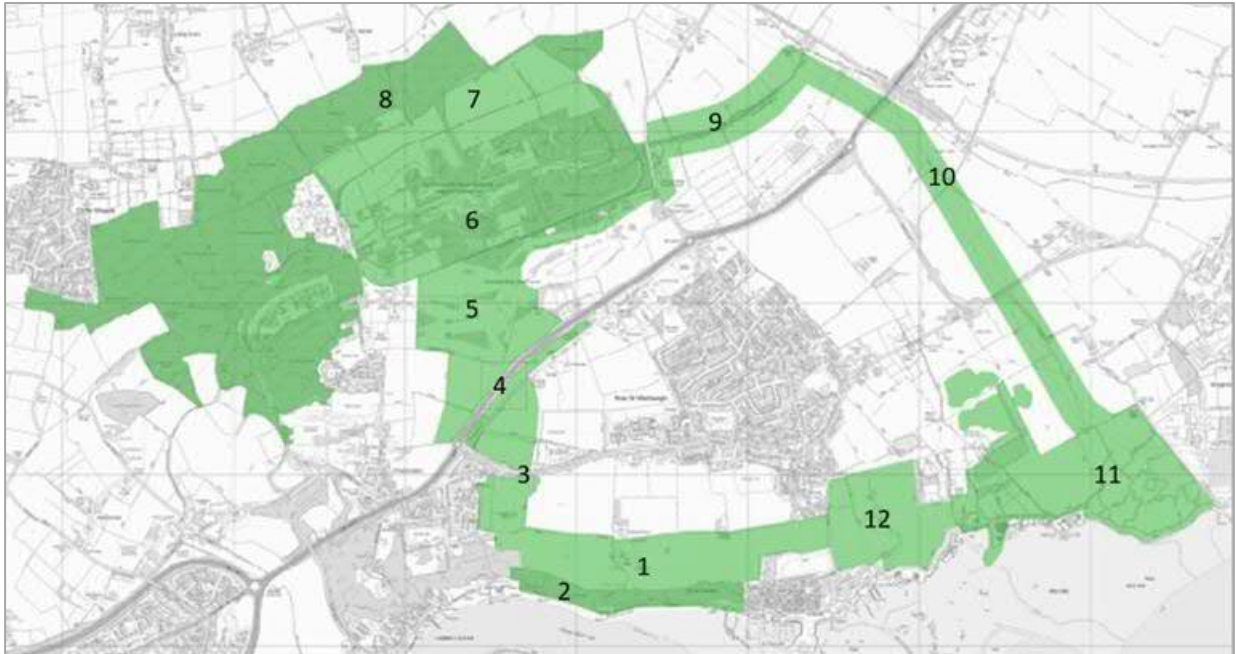


Figure 3: SEMS Location Map

2. Proposed Scheme

2.1. Overview of all phases

- 2.1.1 The highways proposals will accommodate future traffic growth associated with any future housing proposals for the Hoo Peninsula.
- 2.1.2 The Proposed Scheme will include improvements to existing infrastructure, as well as the provision of new infrastructure including new slip roads, junctions and interchanges on the A228 and A229, a relief road via Woodfield Way i.e. a second road access to the peninsula, and wider highway improvements.
- 2.1.3 These changes will help to maximise the use of existing infrastructure whilst also creating additional capacity to facilitate future Hoo growth.
- 2.1.4 The network comprises several key strategic A roads serving Strood and the Hoo Peninsula, namely the A289 and the A228.

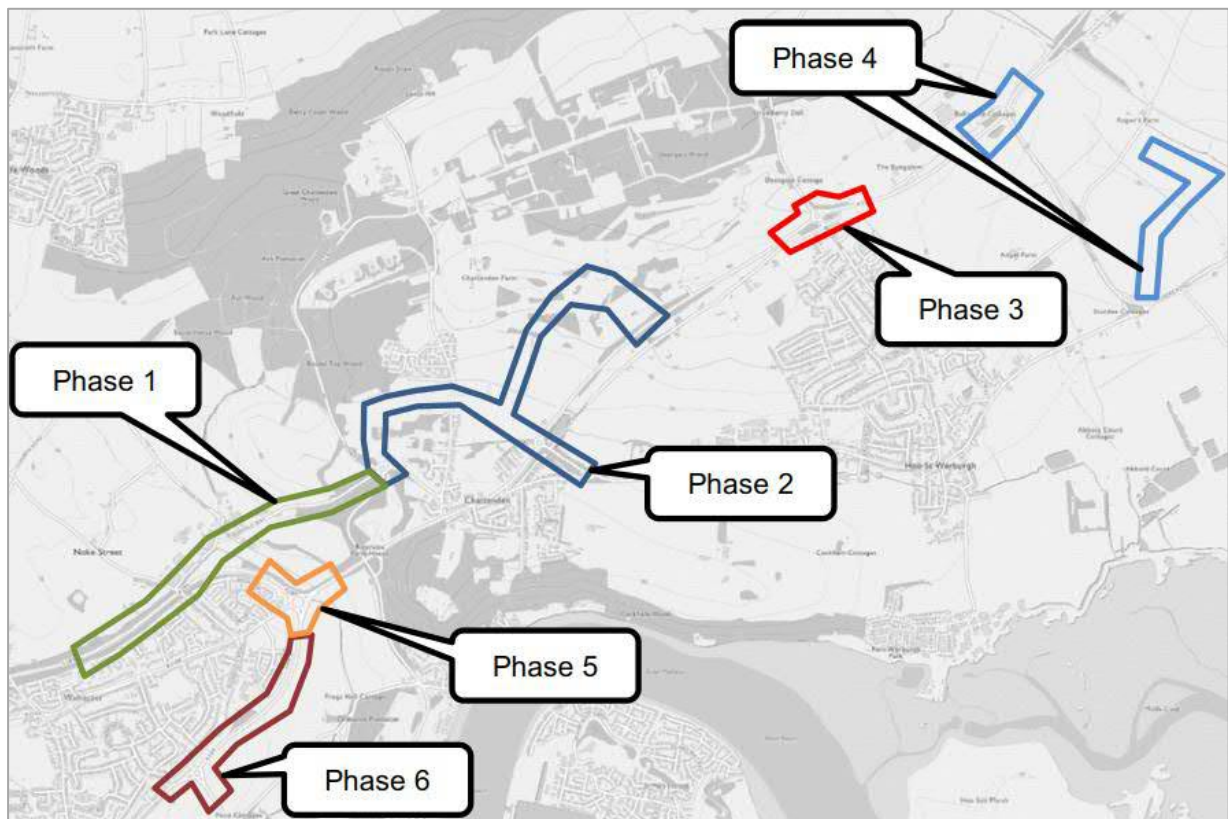


Figure 4: Location of the phases of the proposed highway improvements

2.1.5 Figure 2 shows that the improvements split into six individual phases.

- Phase 1 (in green) includes a new junction controlled by traffic signals to link the A289 with Islingham Farm Road, plus improvements to Higham Road and Woodfield Way.
- Phase 2 (in dark blue) includes a new relief road, connecting Upchat roundabout to the A228. A new spur link road and roundabout will also be introduced to ease congestion.
- Phase 3 (in red) entails improvements to the existing Bell's Lane roundabout to accommodate traffic growth.
- Phase 4 (in light blue) shows the measures to be implemented at Ropers Lane roundabout to accommodate the new rail station.
- Phase 5 (in orange) consists of improvements to Four Elms roundabout.
- Phase 6 (in brown) involves upgrading the existing A289 Wulfere Way and Sans Pareil roundabout to ease network congestion.

2.1.6 The description of the works in the following sections includes initial suggestions for how provision will be made for walkers, cyclists and horse riders. We are undertaking a walking, cycling and horse-riding assessment and review (WCHAR) for all phases of the highways works. This will inform any further design requirements relating to the provision of walking, cycling and horse-riding facilities.

2.1.7 Interested groups will be consulted on the WCHAR process, including Medway Local Access Forum and others.

2.2. Phase 1 – New Relief Road – Improvements to existing Highways including providing new slip roads to Higham Road junction, new overbridge, improvements to Islingham Farm Road and Woodfield Way

2.2.1 The proposed scheme is described below and shown in Figure 5 and Figure 6.

A289 junction

2.2.2 A new junction on the A289 Hasted Road is proposed at the Higham Road intersection with new slip roads from the current Hasted Road bridge down to the A289.

Higham Road

2.2.3 The junction of Higham Road, traffic from the A289 and Islingham Farm Road will require traffic signals and give priority for through traffic passing to and from the A289 to/from Islingham Farm Road.

Islingham Farm Road

- 2.2.4 There will be an upgrade of the existing single lane Islingham Farm Road, which will be widened to two lanes. There will also be provision of a new footway and cycle path, and the creation of a new link to Woodfield Way. The works also involve embankment strengthening, utilities diversions and changes to fencing at the adjacent MOD Training Centre.

Woodfield Way

- 2.2.5 Improvements to Woodfield Way will make the road suitable for increased public use.
- 2.2.6 The works comprise improvements to the surface of the existing carriageway and footways, providing new crossings, and improving fencing. No works are proposed that will directly impact upon the adjacent Chattenden Woods and Lodge Hill SSSI. The works will take place within the existing hard surfaces.

Walking and cycling

- 2.2.7 Shared footways will be provided on Islingham Farm Road and Woodfield Way. Users of the public rights of way (RS119 – Granary Cottage to Hoo Road) at Woodfield Way will be accommodated as part of the road improvements to maintain the route. Other public rights of way across the road will not be affected by the works.

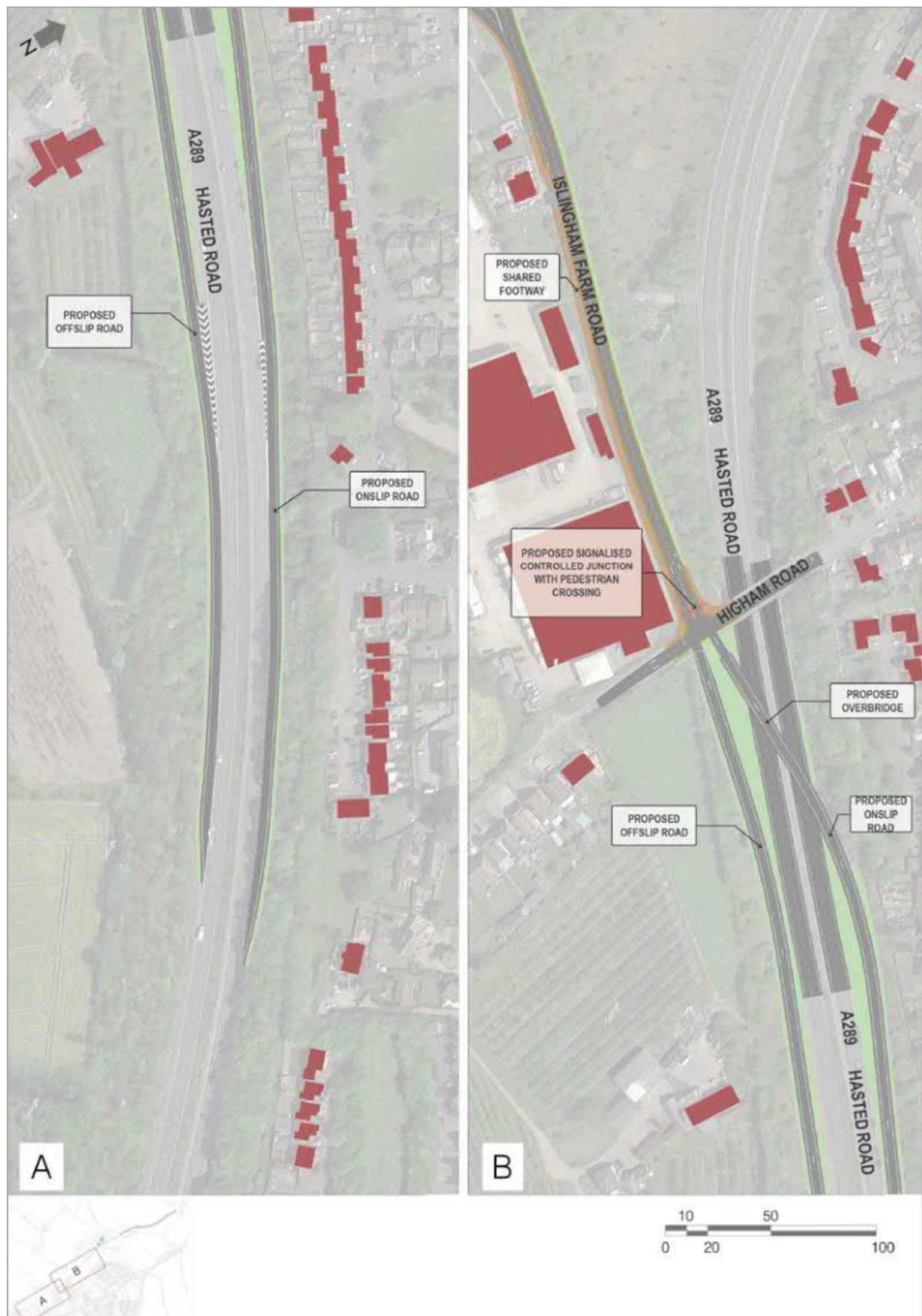


Figure 5: Phase 1 - Modifications to A289 including providing proposed slip roads to Higham Road Slip Road to Higham Road junction, new overbridge, improvements to Islingham Farm Road and Woodfield Way

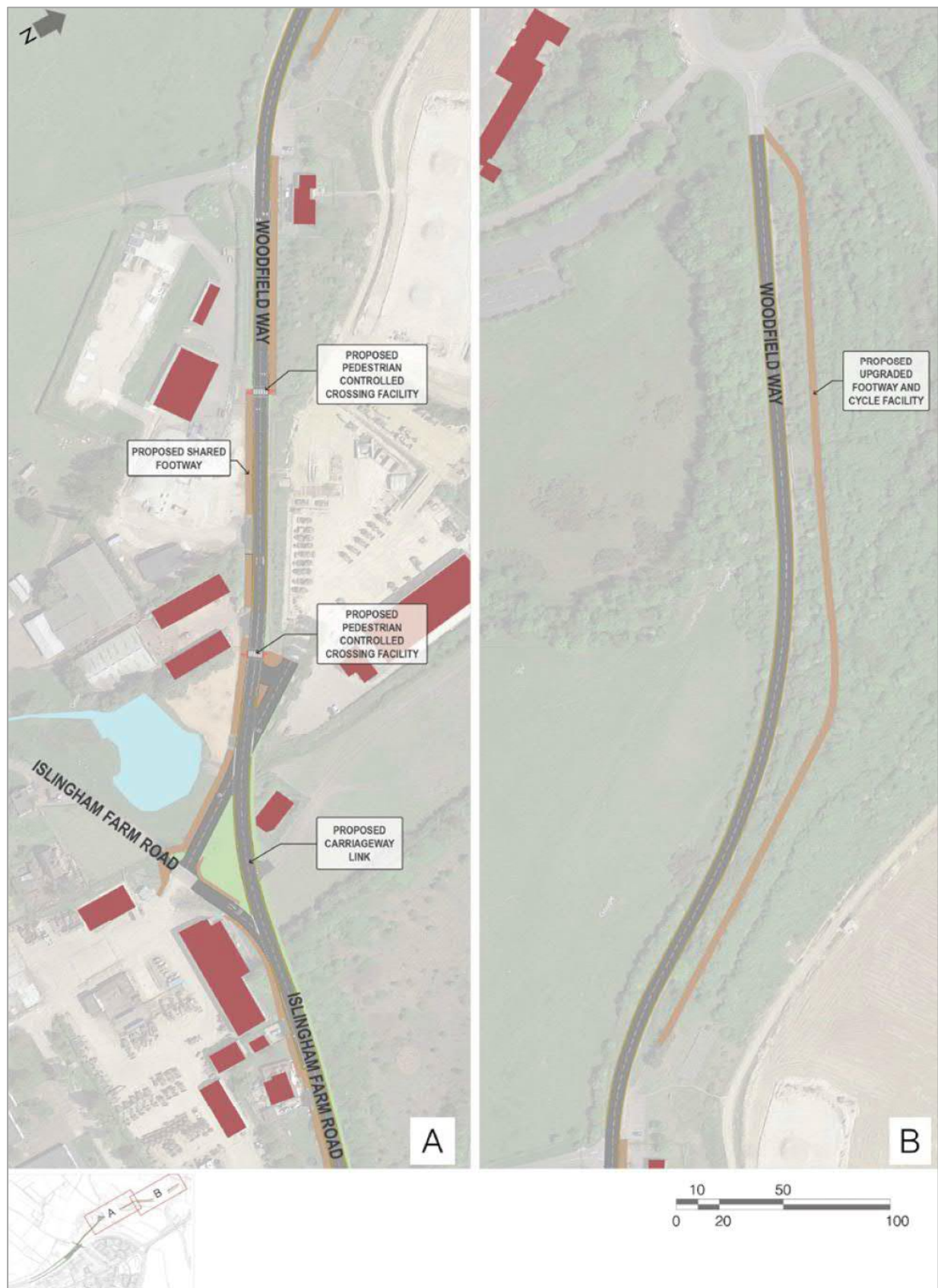


Figure 6: View A shows the widening of Islington Farm Road, realigned with Woodfield Way to provide improved traffic flow. View B shows the improvements along the existing Woodfield Way including the provision of several crossing points, and an adjacent shared footway cycleway facility.

2.3. Phase 2 – New Relief Road - Proposed relief road from Upchat Roundabout to Main Road Hoo Roundabout. A228/Main Road Roundabout junction modification. New A228 roundabout and associated spur link road.

2.3.1 Phase 2 of the Proposed Scheme includes the following:

Upchat Roundabout / relief road to Main Road Hoo Roundabout

- 2.3.2 At the northern end of Woodfield Way, the road connects to the existing Upchat Roundabout. Local improvements to Upchat Roundabout are proposed including footway improvements and new street lighting, drainage and signing.
- 2.3.3 A new relief road is proposed to be constructed in the direction north and then to the east, before intersecting with Chattenden Lane. It then continues to join the A228 Main Road Hoo Roundabout adjacent to the site currently being developed by Abbey Developments.
- 2.3.4 This alignment takes account of development sites that have been proposed in the development of the Local Plan to date, and creates opportunities for enhanced cycle and footway links with those development sites if they were to be allocated in the Local Plan and brought forward. Landscaping and screening are being considered to mitigate ecological and visual impacts to any new developments.
- 2.3.5 At the intersection with the existing Chattenden Lane, a junction controlled by traffic signals is proposed to allow safe controlled crossing points.
- 2.3.6 The proposed improvements at Upchat roundabout include a new link for pedestrians and cyclists across the roundabout (Figure 7). To the north east of the roundabout a new relief road is to be provided. Provision of bus stops are proposed in both directions to facilitate future bus services.
- 2.3.7 Figure 8 shows the continuation of the relief road to the east. View A shows a new signal-controlled junction where the relief road intersects with Chattenden Lane. Moving east, a new roundabout is to be introduced that will serve proposed developments and provide a spur link. This link will provide a more direct route to the A289, easing traffic congestion on the A228 Main Road. View B shows Main Road Chattenden south of the A228. Improvements include relocation of the existing crossing facility to provide improved connections into the Abbey Homes development.

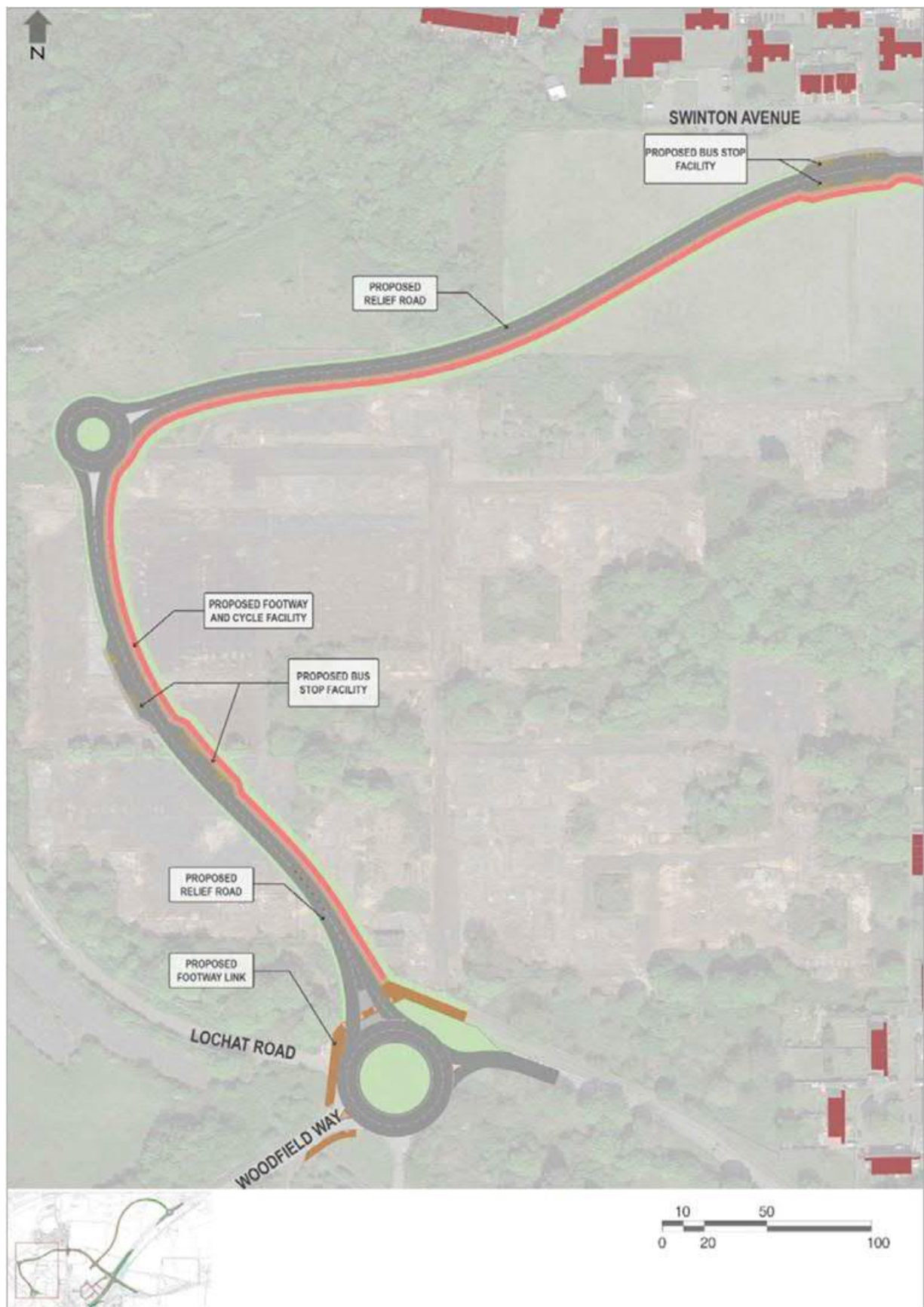


Figure 7: Phase 2 - Proposed Relief Road from Upchat Roundabout to Chattenden Lane.

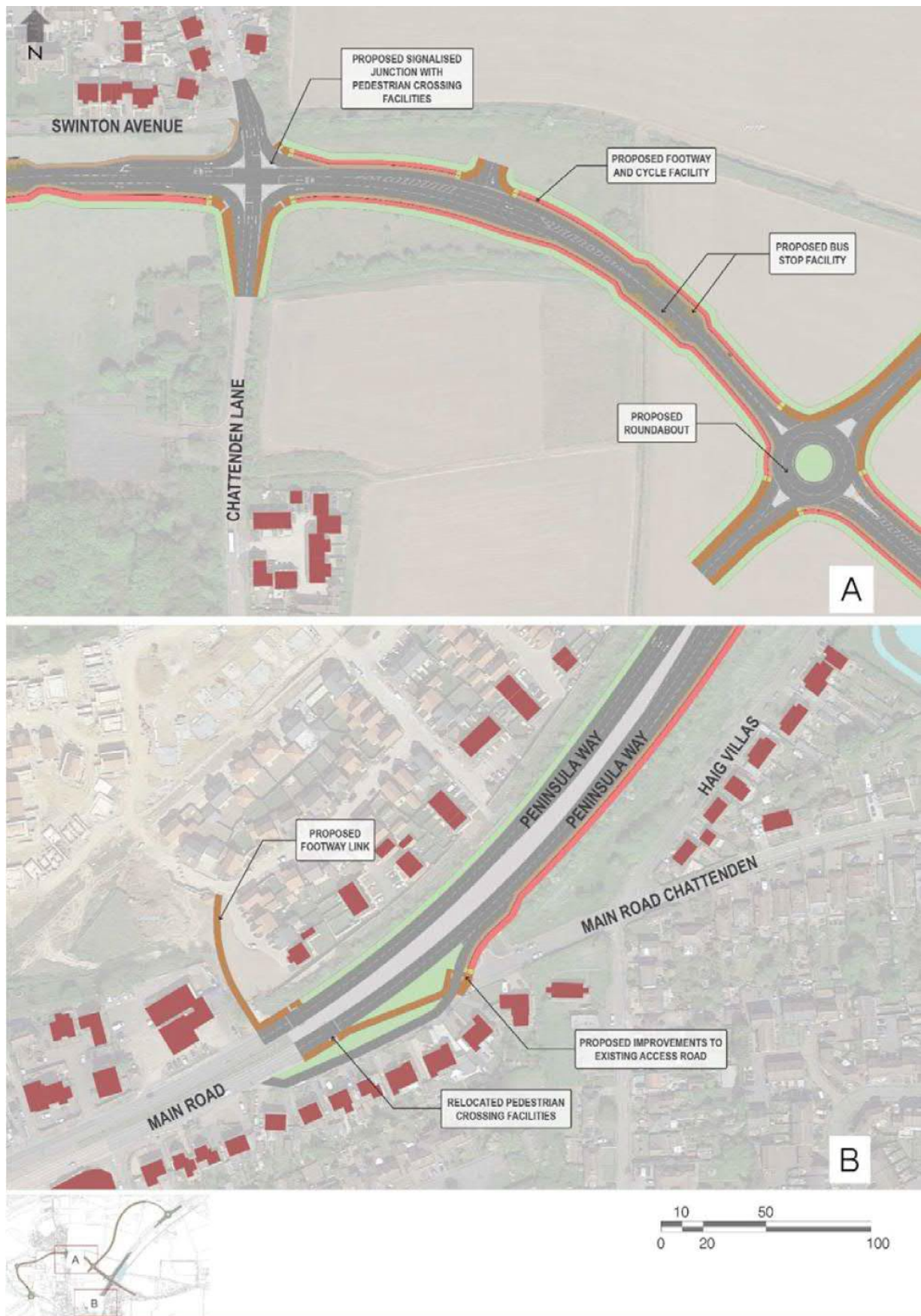


Figure 8: Phase 2 – Shows the continuation of the relief road to the east

Main Road Hoo Roundabout

2.3.8 To support the new relief road, a number of changes are required at the existing A228/Main Road Hoo Roundabout. These are shown in Figure 9 and include the following:

- signals will be introduced;
- a dedicated slip road to the A228 northbound will be provided;
- the existing access to the Abbey Developments development site currently under construction will be relocated;
- the single carriageway road link between the Main Road Hoo Roundabout and the Main Road Chattenden Roundabout will be upgraded to two lanes in each direction with a new left turn slip lane to the A228 southbound; and
- Ratcliffe Highway will be stopped up at its junction with Main Road, with traffic no longer able to pass between these two roads.

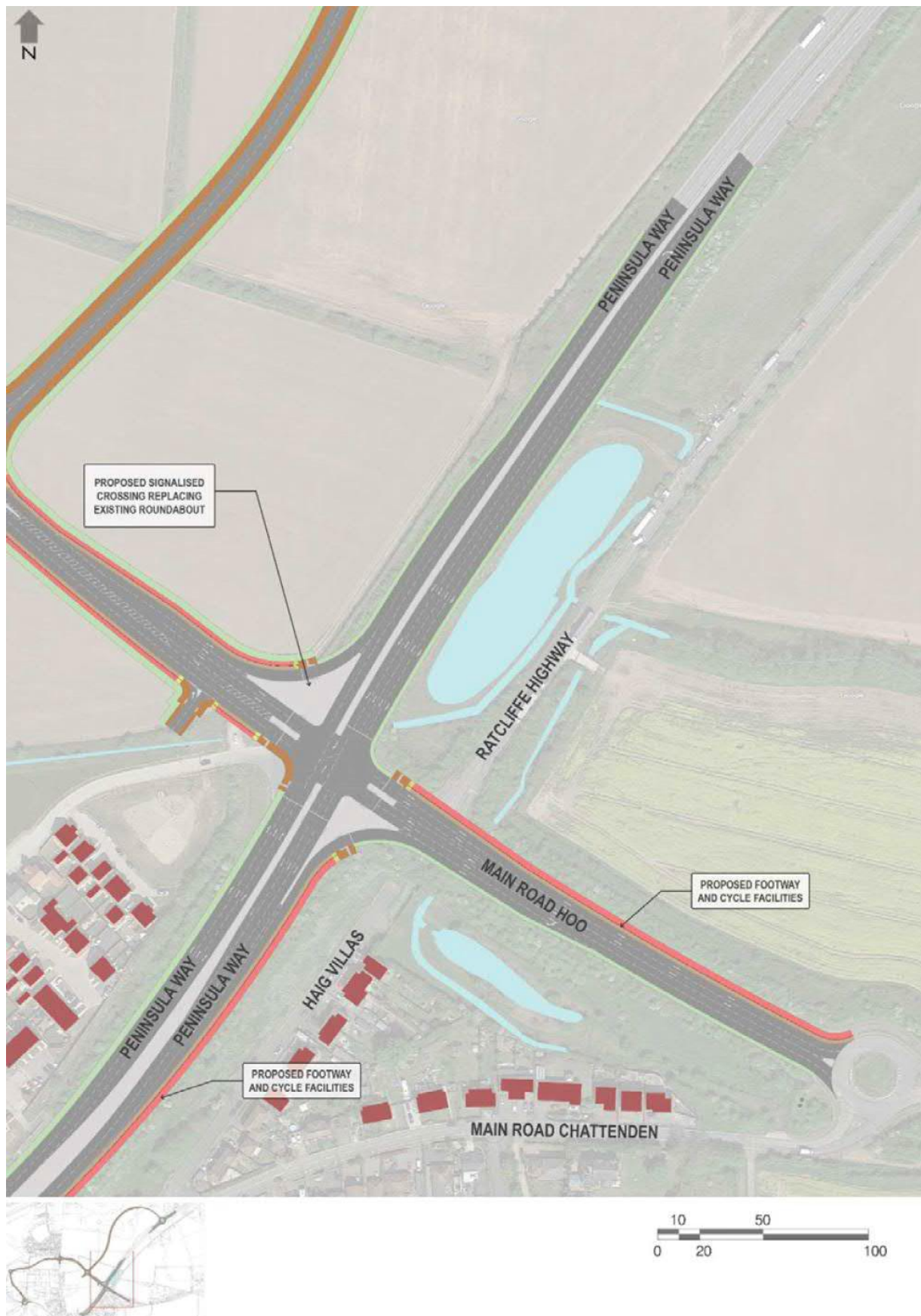


Figure 9: Phase 2 – Proposed A228/Main Road Roundabout junction modification

New A228 Roundabout and Spur Link Road

- 2.3.9 An additional spur road is proposed from a roundabout junction with the New Relief Road to the east of Chattenden Lane, to an additional roundabout proposed between Main Road Hoo and Bell's Lane roundabout, passing through a small southern part of the former Deangate Ridge golf course.
- 2.3.10 Figure 10 shows the continuation of the new spur road which provides direct route to the A289, easing traffic congestion on the A228 Main Road Provision is also being made to cater for pedestrian and cycling use.



Figure 10: Phase 2 – Proposed associated spur link road

- 2.3.11 Figure 11 shows the new spur link road and its intersection with the A228 Peninsula Way where a new roundabout will be introduced between Main Road Hoo and Bell's Lane.



Figure 11: Phase 2 - Proposed A228 Roundabout and associated spur link road.

Walking and cycling

- 2.3.12 The road improvements will include footways to provide priority for pedestrians and cyclists in terms of movement and crossing points. This will help to facilitate safe and easy pedestrian and cycling movement through the various developments in the area.
- 2.3.13 Segregated cycle tracks are also proposed for the relief road and the Main Road junction.

2.4. Phase 3 - Improvements to A228 Bell's Lane Roundabout and Dux Court Road (widening and link road)

- 2.4.1 The existing Bell's Lane Roundabout will be modified to improve access from the adjoining Bell's Lane and Dux Court Road.

Walking and cycling

- 2.4.2 Footway and cycling provisions have been provided on the southern side of the A228 to tie-in to the existing facility at Bell's Lane and Ratcliffe Highway. A crossing with traffic signals will be situated east of the Bell's Lane roundabout providing a link towards a shared footway north of the A228. This provides a safer route for pedestrians as it moves them away from the roundabout.
- 2.4.3 Existing public rights of way across the road improvements are not impacted by the works.



Figure 12: Phase 3 - Improvements to A228 Bells Lane Roundabout & Dux Court Road (widening and link road)

- 2.4.4 Figure 12 shows the proposed improvements at Bell's Lane.
- 2.4.5 The existing roundabout configuration will be modified to provide capacity for additional traffic, whilst improving the links between Dux Court Road and Bells Lane for all modes.

2.5. Phase 4 - Improvements to Ropers Lane Roundabout and Modification to the Stoke Road roundabout to allow access to the new station

- 2.5.1 Phase 4 of the Proposed Scheme includes the following:
- 2.5.2 The existing Ropers Lane Roundabout will be modified to accommodate the projected traffic growth from adjacent housing developments and the proposed rail station. The existing Stoke Road roundabout is being modified to allow access to the new rail station.

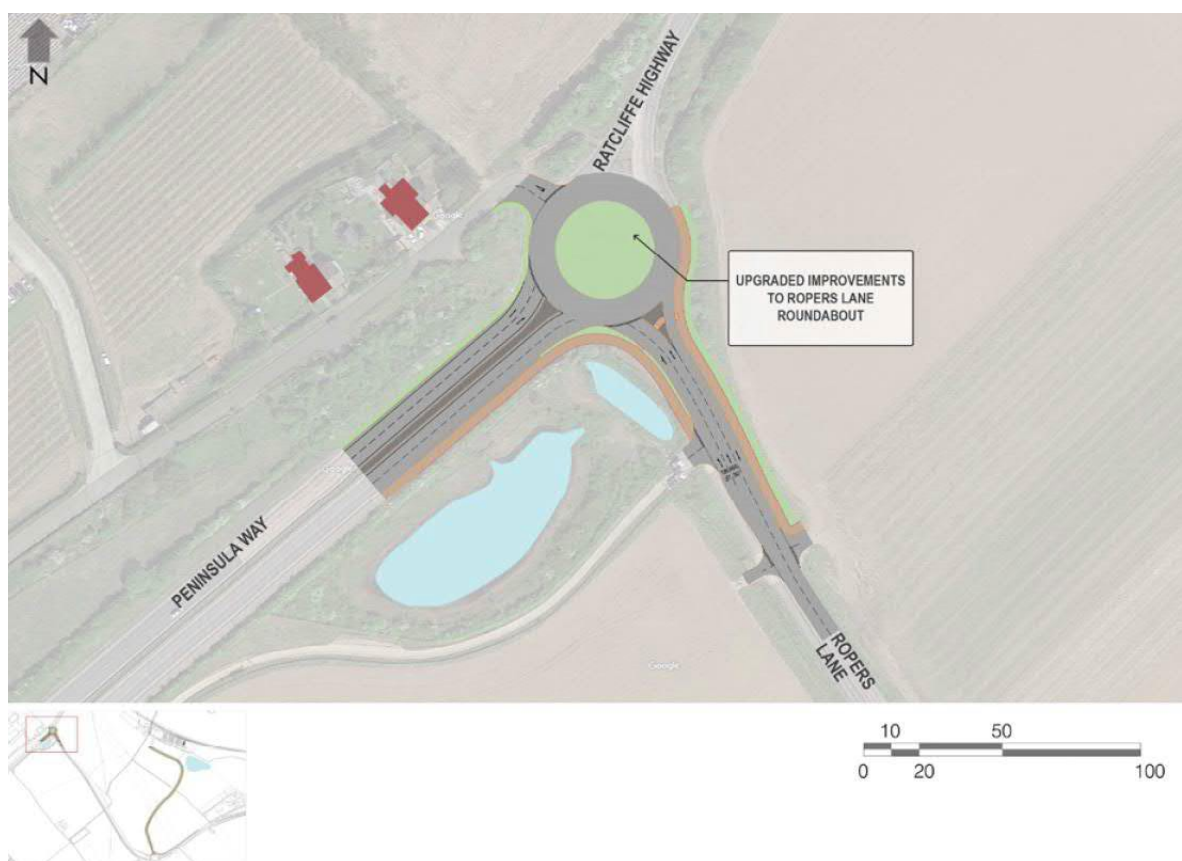


Figure 13: Phase 4 – Improvements to Ropers Lane Roundabout

- 2.5.3 Figure 13 indicates the improvements proposed at Ropers Lane roundabout to accommodate additional traffic associated with the rail station.
- 2.5.4 A new highway link is proposed from the existing Stoke Road roundabout which will provide access into the new station for vehicles, pedestrians and cyclists. This is shown in Figure 14.



2.6. Phase 5 - Four Elms Roundabout

The proposed works

- 2.6.1 To increase road capacity on Four Elms Roundabout the following interventions are proposed.

- Additional lane on approach roads
- Increased circulation capacity at the roundabout
- A new highways drainage pond and associated access
- A dedicated slip road from the A289 Hasted Road to northbound A228.

Walking and cycling

- 2.6.2 As part of the new proposals, a new shared pedestrian/cycle footway and crossing facilities will be provided following on from intended collaboration with key stakeholders.
- 2.6.3 The public rights of way (RS119 – Granary Cottage to Hoo Road) at Four Elms Hill will be re-routed around the embankments to maintain the route.



Figure 15: Phase 5 – Four Elms Roundabout

- 2.6.4 Figure 15 indicates the additional measures being provided at Four Elms Hill to ease congestion. This includes the introduction of slip lanes to cater for the additional traffic to the Peninsula.
- 2.6.5 Maintenance areas will be provided as well as signal-controlled crossings to improve safety and accessibility at the junction for pedestrians and cyclists.

2.7. Phase 6: Wulfere Way and Sans Pareil Roundabout

2.7.1 Phase 6 of the Proposed Scheme includes the following:

Wulfere Way

2.7.2 Wulfere Way is currently a two-lane dual carriageway. As part of the improvements, an additional lane in each direction is proposed.

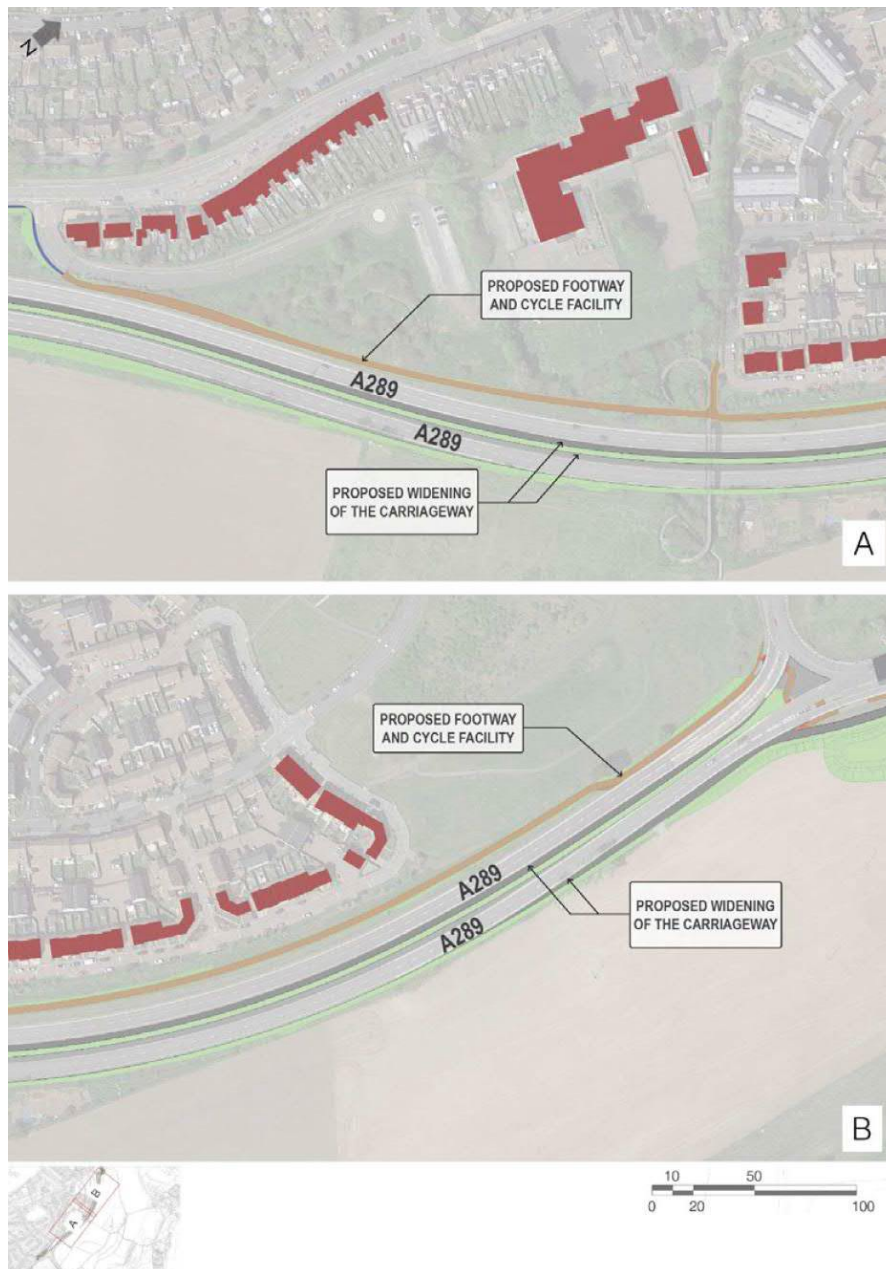


Figure 16: Phase 6 - Wulfere Way

2.7.3 Figure 16 shows the proposed works along the A289 Wulfere Way. The works include the widening of the existing carriageway to provide three lanes in each direction. A footway

cycleway will be provided along its length, connecting the facilities at Four Elms roundabout and Sans Pareil.

Sans Pareil Roundabout

- 2.7.4 Various improvements are proposed at this roundabout including an additional lane on approaches, increased circulation capacity and a dedicated slip road to the northbound A228. The Wainscott Road access to the roundabout is also proposed to be relocated to reduce conflict at the roundabout and improve access to and from Benenden Road and Wainscott Road.

Walking and cycling

- 2.7.5 New pedestrian/cycle footway and crossing facilities will be provided following on from intended collaboration with key stakeholders.

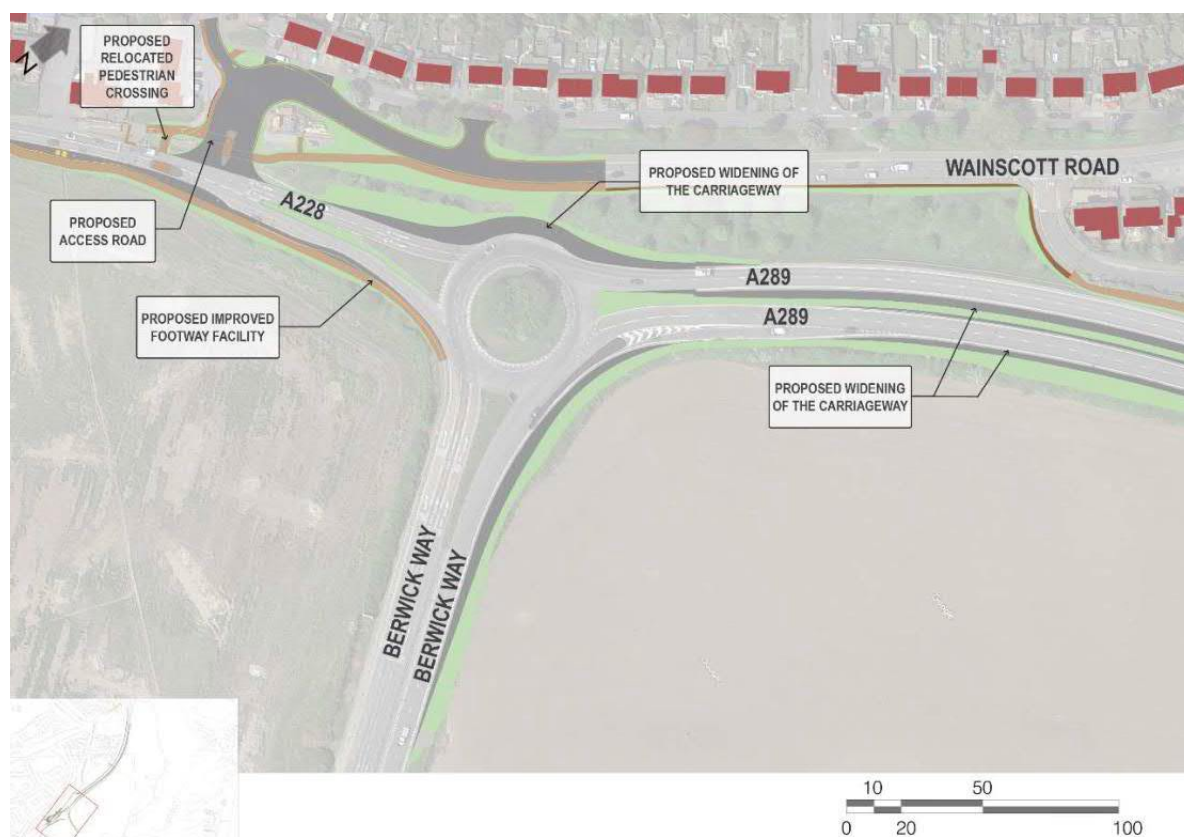


Figure 17: Phase 6 - Sans Pareil Roundabout

- 2.7.6 Figure 17 shows the roundabout extension required to accommodate additional lanes that will increase circulation capacity and reduce queuing.
- 2.7.7 The access to Wainscott Road and Benenden Road will be relocated away from the junction and additional pedestrian and crossing facilities provided to improve accessibility.

2.8. Construction

- 2.8.1 We will seek to minimise disruption to the existing highway network during the construction period. Construction of the six packages is to be split into stages to avoid impacting the existing highway network. Construction within Phase 2 will be mostly constructed away from the highway network. Site compounds will be located within the surrounding land.
- 2.8.2 During the construction period, traffic flows will be maintained where possible. Any road closures required will be restricted to night-time only and suitable diversion routes will be provided. Residential access will be maintained throughout construction. Consultation will take place with key stakeholders such as Police and emergency services before works are carried out to consider phasing, traffic management and suitable diversion routes. Variable messaging signs (VMS) will be used to inform road users of the works and alternative routes. Information leaflets will be sent to inform local residents and businesses of the proposed construction works in advance of them taking place in each locality. These measures will form part of a Construction Traffic Management Plan, an outline of which will be submitted with the planning application for the proposals.

2.9. Operation

- 2.9.1 Project completion is programmed for March 2024. This is taken to be the opening year of the scheme. A number of technical assessments will consider the operational scheme 15 years from the opening year. For these assessments, the future year is taken to be March 2039.

2.10. Decommissioning

- 2.10.1 The highway works will be designed to have a life of at least 40 years and with bridge structures will have a design life of 120 years. Given that the Applicant has no plans to decommission the Scheme, further consideration of decommissioning is not considered appropriate. It is therefore proposed that decommissioning is scoped out of the EIA.

3. Key Legislation and Planning Policy

3.1. EIA Statutory Requirements and Guidance

- 3.1.1 The EIA will be undertaken in accordance with legislative requirements and current guidance, in particular:
- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended 2018);
 - EMA 'Environmental Impact Assessment Guide to Delivering Quality Development', July 2016; and
 - Design Manual for Roads and Bridges (DMRB).
- 3.1.2 Each topic chapter of the Environmental Statement (ES) will include a review of relevant legislation and guidance.
- 3.1.3 It is acknowledged that the Environment Bill is currently being considered by Parliament, and may be enacted prior to the ES submission being made. This will be kept under review as the application is developed and the EIA process is undertaken.

3.2. Planning Policy Context

National Planning Policy Framework

- 3.2.1 The most recent National Planning Policy Framework (NPPF) was adopted in February 2019, superseding the previous NPPFs from 2012 and 2018. The NPPF sets out the Government's planning policies for England and how these should be applied. The NPPF must be considered when preparing the development plan and is a material consideration in planning decisions.
- 3.2.2 The NPPF is divided into a series of themes in order to achieve its aim of delivering sustainable development. Some of the key themes within the NPPF that will be considered within this report and the Environmental Statement include sustainable transport, making effective use of land, meeting the challenge of climate change, flooding and coastal change, conserving and enhancing the natural environment (which includes habitats and biodiversity, and ground conditions and pollution), conserving and enhancing the historic environment, and facilitating the sustainable use of minerals.
- 3.2.3 There are also a number of National Planning Practice Guidance (NPPG) documents which cover topics discussed in the NPPF. Examples of NPPG documents relevant to the Proposed Scheme include Air Quality, Waste, Noise, Environmental Impact Assessment, amongst others.

Local Planning Policy and Guidance

- 3.2.4 The current Local Plan for Medway was adopted and launched in May 2003 to replace Medway Towns Local Plan 1992 and the Medway Local Plan Deposit Version 1999.
- 3.2.5 It is acknowledged that Medway's new Local Plan, Future Medway 2019-2037, will replace the 2003 Local Plan and this updated plan will be adopted in 2021, subject to the outcome of an independent examination by a planning inspector. It is mentioned on Medway Council's website that the draft of the Future Medway Local Plan will be released in Summer 2020, however at the time of writing, this document has not been released.
- 3.2.6 Medway Council will be consulted as part of the EIA to determine which policies are to be retained from the 2003 local plan and referenced within the ES. Where 2003 policies are considered to be outdated, updated policies from the emerging Future Medway Local Plan may be referenced, as agreed with Medway Council.

4. Proposed EIA Methodology

4.1. Approach to EIA

- 4.1.1 The EIA will be undertaken in line with the requirements of the EIA Regulations 2017. The findings of the EIA will be presented in an ES, which will be produced in accordance with Schedule 4 of the EIA Regulations, which details the information for inclusion in an ES.
- 4.1.2 The EIA will identify the likely direct, indirect, cumulative, short, medium and long-term, permanent, temporary, beneficial and adverse significant effects arising from the Proposed Scheme. The ES will describe the mitigation measures required to avoid, reduce or remedy the significant adverse effects identified.
- 4.1.3 Each topic chapter of the ES will define the baseline against which the likely significant environmental effects of the Proposed Scheme will be assessed. Study areas applied when determining the baseline shall be clearly defined. Study areas will vary according to the environmental discipline under consideration and will reflect the project and the surrounding environment over which effects are reasonably thought to occur, taking account of guidance and professional judgement. It may be necessary for a topic chapter to apply multiple study areas, relative to the sensitivity of receptors or the extents of potential impacts. The anticipated study areas to be applied to each environmental discipline have been defined within the topic chapters of this EIA Scoping Report.
- 4.1.4 Following on from the definition of the baseline conditions, the mitigation measures embedded into the scheme design will be described. The impact of the Proposed Scheme will be assessed for both the construction and operation phases of the development taking account of those embedded mitigation measures.
- 4.1.5 Following that assessment, additional mitigation measures will be identified, where possible, to reduce adverse effects and, following the incorporation of mitigation measures, the significance of any remaining residual effects will be defined. Cumulative effects will then be identified and assessed.

4.2. Approach to Assessment Scenarios

- 4.2.1 The ES will define the scenarios against which the environmental effects will be assessed. This will include the following scenarios:

Baseline Scenario

- 4.2.2 The EIA will clearly need to consider the impact of Covid-19 on the baseline measurements for a number of topic chapters for example, noise and vibration, and air quality). We propose to liaise with the relevant authorities in order to agree how most effectively to do this.

- 4.2.3 In each of the topic chapters the baseline environmental conditions will be defined and described without the project in place. The baseline scenario will consider the site location and the surrounding area as far as environmental effects are anticipated. Each topic baseline will define existing land-uses and environmental receptors / resources relevant to the environmental topic.
- 4.2.4 Each of the environmental topic chapters will set a baseline study area based upon the anticipated extent of environmental effects, taking account of the nature of the Proposed Scheme, guidance and professional judgement.

Future Baseline

- 4.2.5 A description of the likely evolution of the current state of the environment without implementation of the project (i.e. 'future baseline scenario') will also be provided, with reasonable effort based on the availability of environmental information and scientific knowledge. When describing the future baseline scenario, readily available information such as local plans, designated site management plans and climate change scenario data will be used to provide a description of the natural and development changes in the local environment over an appropriate timescale.
- 4.2.6 For some topic chapters, the baseline situation during the construction period or operational years is unlikely to be any different from the existing baseline. However, for other topics the baseline will not be static, and it is important to include a forecast of changes to the baseline, if that baseline is expected to be different from the existing one, both as a result of committed development and from any 'natural' changes from the baseline. The 'do nothing' / 'do minimum' scenario (the evolution of the baseline environment were the Scheme not to be constructed) will be included where appropriate within each of the environmental topic chapters. Table 1 explains the need for baseline forecasting for each technical chapter.

Table 1: How the future baseline is likely to be considered within topic chapters

Topic	How Future Baseline will be considered
Air Quality	The do-nothing scenario is an intrinsic requirement of the assessment of road traffic during the operational phase in so far that the change in the future with and without the Scheme in place is the measure of the environmental effect caused by the Scheme. This will take account of Defra's Emissions Factors Toolkit and related tools, which include predicted changes from the baseline scenario.
Noise and Vibration	Similarly, to air quality the assessment of change in road traffic noise with and without the Scheme in place is a fundamental part of the assessment.
Nature Conservation	No forecasting is considered to be required. Climate change could alter the distribution of certain species, and changes to rainfall patterns could alter the hydrology of habitats; however, these changes cannot be predicted with any certainty.
Historic Environment	The future development baseline would be considered in respect to the potential impacts upon on the setting of Heritage Assets.
Landscape and Visual	An assessment of the future landscape will be included within the ES. Whilst not strictly the do-nothing scenario, the ES will present an assessment of (i) how the local landscape is expected to develop; and (ii) how the landscape character is expected to change in the absence of the Scheme.

Topic	How Future Baseline will be considered
Road Drainage and the Water Environment	In relation to flood risk and acceptability of the road drainage proposals, the assessment will identify the change in flood level and run-off that will be experienced should the Proposed Scheme be constructed, above the do-nothing scenario within that time period, taking account of climate change factors.
Climate Change	Where the assessment of effects has drawn on the results of other technical assessments, any forecasting undertaken for those assessments applies. The climate change chapter will consider measures that have been built into the Proposed Scheme design to take account of climate change factors.
People and Communities	Where the assessment of effects has drawn on the results of other technical assessments, any forecasting undertaken for those assessments applies. The assessment considers the effects of the Scheme on development land and the increased pressures on local services / open space arising from the construction and use of committed developments during the development of the future baseline.
Materials	No forecasting required as it is not anticipated that the baseline has potential to change substantially over the Proposed Scheme timescales.
Geology and Soils	No forecasting required as it is not anticipated that the baseline has potential to change substantially over the Proposed Scheme timescales.
Traffic and Transport	The traffic and transport chapter will identify and consider committed developments in the construction and operational phases of the Proposed Scheme in considering the changes to traffic on the highway network, including junctions.
Major Accidents and Disasters	In the absence of the Proposed Scheme the assessment will consider likely changes in baseline conditions as a result of 'other development' being pursued.
Cumulative Effects	The cumulative effects chapter will identify and consider committed developments in the construction and operational phases of the Proposed Scheme in considering in-combination effects with the effects of the Proposed Scheme, which would have taken account of the future baseline as discussed in the above topics.

4.3. Assessment of Significant Effects

- 4.3.1 It is proposed that the methodology and criteria used for the EIA is based upon the approach published in the Design Manual for Roads and Bridges (DMRB) guidance document LA 104 Environmental Assessment and Monitoring. The document publishes overarching criteria for determining receptor value (or sensitivity) and impact magnitude are reproduced in Table 2, Table 3 respectively.
- 4.3.2 It is possible that individual topic chapters may depart from this approach, particularly where alternative criteria and terminologies are offered in topic specific guidance documents. This will be explained in the relevant topic chapters of the ES.

Assessing Receptor Sensitivity

- 4.3.3 For each of the sensitive receptors identified, a level of value or sensitivity will be assigned in accordance with the criteria presented in Table 2.

Table 2: Criteria for assessing environmental value (sensitivity)

Value (sensitivity) of receptor / resource	Typical description
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Assessing Impact Magnitude

- 4.3.4 The potential impacts of the proposed project will be reported within environmental assessments. Each of the potential impacts reported will be assigned a level of impact magnitude in accordance with criteria presented in Table 3.

Table 3: Criteria for assessing magnitude of impacts

Magnitude of impact (change)		Typical description
Major	Adverse	Loss of resource and / or quality and integrity of resource; severe damage to key characteristics, features or elements.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Moderate	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of / damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristic, feature or element.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristic, feature or element; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristic, feature or element.
	Beneficial	Very minor benefit to, or positive addition of, one or more characteristic, feature or element.
No Change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Assessing Effect Significance

- 4.3.5 The significance of the effects of the Proposed Scheme will be reported within the ES. The assessment of the significance of environmental effects shall take account of the following factors:
1. The receptors / resources (natural and human) which would be affected and the pathways for such effects;
 2. The geographic importance, sensitivity or value of receptors / resources;
 3. The duration (long or short term); permanence (permanent or temporary) and changes in significance (increase or decrease) of the receptor;
 4. Reversibility – i.e. is the change reversible or irreversible, permanent or temporary;
 5. Environmental and health standards (e.g. local air quality standards) being threatened; and
 6. Feasibility of, and mechanisms for, and the effect of, delivering mitigating measures.
- 4.3.6 A matrix-based approach will be used when deriving effect significance from receptor value and impact magnitude. This matrix of significance is presented in Table 4.
- 4.3.7 Unless otherwise stated in individual topic chapters, effects deemed to be of moderate, large or very large significance are deemed to be significant in EIA terms. Effects deemed to be of neutral or slight significance are not deemed to be significant.
- 4.3.8 Where Table 4 includes two significance categories, evidence will be provided to support the reporting of a single significance value.

Table 4: Significance matrix

		Magnitude of impact				
		No Change	Negligible	Minor	Moderate	Major
Environmental Value	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

4.4. Approach to Design and Management Measures

Assessment of Alternative Design Solutions

- 4.4.1 In accordance with the EIA Regulations and statutory guidance, the ES will describe those alternatives to the scheme design that have been considered, including:
- The 'do nothing' scenario – the consequences of no development taking place on the application site;
 - Alternative sites – the rationale applied when selecting the areas of land that will make up the Application Site;
 - Alternative designs – the evolution of the Proposed Scheme design. The ES will present a summary of the reasonable alternatives considered, together with an indication of the main reasons for selecting the chosen option; and
 - Design modifications – updates to the scheme design, particularly as a result of iterative feedback from environmental assessments and consultation processes which have resulted in the incorporation of embedded mitigation.

Embedded and Additional Mitigation

- 4.4.2 The ES evaluates the measures required to avoid, minimise or offset the significant adverse effects of the Scheme. Where measures are integral to the design and the applicant has committed to their implementation, mitigation is termed "embedded mitigation".
- 4.4.3 A number of technical studies, taking account of environmental factors, are being undertaken to inform the design and allow early identification of mitigation measures so that these can be incorporated into the Proposed Scheme. Embedded measures are therefore either incorporated into the design from the outset or identified through the design process that has had environmental input. Proposed environmental enhancements will also be described, where applicable.
- 4.4.4 Embedded measures will be considered prior to the assessment of effects to avoid considering assessment scenarios that are unrealistic in practice. Where likely significant adverse effects are identified after considering these embedded measures, 'additional mitigation measures' will be proposed.
- 4.4.5 Embedded mitigation and enhancement measures will be described within the Proposed Scheme ES Chapter and where necessary in topic chapters, together with the rationale for their inclusion.
- 4.4.6 A preliminary Construction Environmental Management Plan (CEMP) will be produced through the EIA process, and this will capture proposed mitigation measures as well as monitoring requirements.

Transport Assessment

- 4.4.7 The proposed impact assessments would be informed by a Transport Assessment, the findings of which would be used to determine:
- construction traffic movements;
 - suitability of access provision for construction (particularly as we may be using tracks);
 - Public Rights of Way impacts; and
 - Operational traffic movements.
- 4.4.8 The Transport Assessment will accompany the Planning Application and will involve the development of a traffic model, which is likely to be undertaken using the Aimsun traffic modelling software. The Transport Assessment will take account of cumulative developments, details of which are to be discussed with stakeholders.

4.5. Approach to Cumulative Effects

- 4.5.1 Schedule 4 (Paragraph 5(e)) of the EIA Regulations 2017 states that the ES should include a description of the likely significant effects of the development on the environment resulting from
- “...the cumulation of effect with other existing and / or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources.”
- 4.5.2 For the cumulative assessment, two types of effect will be considered:
- The combined effect of multiple individual impacts, for example noise, airborne dust, and traffic on a single receptor; and
 - The combined impacts of nearby consented development which may, on an individual basis, result in effects which are not significant but cumulatively (together with the Proposed Scheme) may have a likely significant effect.

Effect Interactions

- 4.5.3 Effect interactions are the combined or synergistic effects caused by the combination of effects of the Scheme on a particular receptor which may collectively cause a more significant effect than individually. An example of an effect interaction would be where a receptor was affected by dust, noise and traffic disruption during the construction of the Scheme, with the result being a greater level of nuisance than that caused by each individual effect alone.

Cumulative Effects

- 4.5.4 In-combination effects are the combined effects of the construction or operation of the Scheme together with 'other developments' within the same study area, which individually might not be significant, but when considered together could create a significant cumulative effect.
- 4.5.5 There is no widely accepted methodology or best practice for assessing cumulative effects although various guidance documents exist. The Zone of Influence (Zoi) of the Proposed Scheme within which any potential effects of the Proposed Scheme may combine with the effects arising from other developments will be determined on the basis of the maximum study areas of the technical assessments considered within the EIA.
- 4.5.6 A list of schemes within the ZOI to be included in the cumulative effects assessment will be identified and filtered on the basis of project specific criteria to shortlist 'other developments' for the assessment of cumulative effects together with the Proposed Scheme. Each technical assessment reported within the EIA will consider which of these schemes may result in cumulative effects together with the Proposed Scheme from the perspective of the relevant technical assessment. This process will be discussed and agreed with Medway Council as the host local planning authority for the Proposed Scheme.

Developments for Consideration

- 4.5.7 It is proposed that the EIA will consider the cumulative effects of the Proposed Scheme in combination with:
- The planned delivery of approximately 10,600 new homes over the next 15 years (as detailed in Section 1.2.3). This will be informed by the Regulation 18 and Regulation 19 versions of the Medway Future Local Plan, the latter of which is due to be published as the ES is developed.
 - The rail infrastructure improvements (reopening of the Grain Branch Line) as detailed in Section 1.2.3); Delivery of both the rail and highways improvement is required to accommodate the 10,600 new homes.
 - The planned SEMS in response to the delivery of the 10,600 new homes (as detailed in Section 1.2.3). Several of the proposed Strategic Environmental Management Areas are within close proximity to the Proposed Scheme and, therefore, there is the potential for the Proposed Scheme to impact upon ecological or environmental management activities that are due to happen as part of the SEMS. It is likely that if planning permission is granted, both projects will be worked on at the same time. The SEMS will thus be considered further within the EIA.
 - As part of the Thames Gateway Kent Plan for Growth, 2014-2020, there is the potential for development to be in process during the construction of the Proposed Scheme.

5. Air Quality

5.1. Scoping Baseline

Data Sources and Study Area

5.1.1 The following baseline section has been compiled using data gathered from the following sources:

- Medway Council's Air Quality Annual Status Report (ASR) 2020 published in June 2020;
- KentAir website, Reporting Air Quality in Kent and Medway.

5.1.2 The following study areas have been used when identifying the baseline conditions at the site:

- The immediate vicinity of the Application Site where the likely greatest impacts will be observed; and
- Consideration is also given to areas where the annual mean air quality objective for nitrogen dioxide (NO₂) of 40 µg m⁻³ is currently being exceeded.

5.1.3 Local authorities are required to periodically review and assess the current and future quality of air in their areas. Where it is determined that an air quality objective is not likely to be met within the relevant time period, the authority must designate an Air Quality Management Area (AQMA) and produce a local action plan.

5.1.4 As indicated in Figure 18, there is an extensive network of roads within the Medway Council's administrative area that are declared as AQMA. These have been designated for exceedance of the annual mean air quality objective for NO₂. The principal source of elevated concentrations of NO₂ within these areas is from vehicle emissions. Medway Council has declared four AQMA's (Central Medway, High Street Rainham, Pier Road Gillingham and Four Elms Chattenden).

5.1.5 Gravesham Borough Council (GBC) has previously declared seven AQMA's but these have recently (October 2018) been reduced to four as follows:

- A2 Trunk Road (declared for annual mean NO₂ and 24-hour mean PM₁₀);
- Northfleet Industrial Area (declared for annual mean PM₁₀);
- A226 one-way system in Gravesham (declared for annual mean NO₂); and
- A227/B261 Wrotham Road/Old Road West Junction in Gravesham (declared for annual mean NO₂).



Figure 18: Location of Air Quality Management Areas within the Medway Council Area

- 5.1.6 The A289 links up with the A2 to the west of the proposed highways improvements and has the potential to be affected by additional traffic generated by the scheme. The location of the A2 AQMA is presented in Figure 19.
- 5.1.7 Both Medway Council and Gravesham Borough Council have continuous automatic and diffusion tube monitoring networks. In 2019, Medway Council had two continuous monitoring sites (Chatham and Rochester Stoke). These are both Defra operated Automatic Urban and Rural Network (AURN) monitoring sites. The Chatham site measures NO₂ and fine particles (PM₁₀ and PM_{2.5}) and is an urban centre site located within the Central Medway AQMA. The Rochester Stoke site is a rural background site and measures NO₂, PM₁₀, PM_{2.5}, sulphur dioxide (SO₂) and ozone (O₃). The locations of the monitoring sites are identified in Figure 20.
- 5.1.8 In addition to the two continuous monitoring sites, there are 43 diffusion tube monitoring sites in Medway Council for measuring NO₂. These are mostly located within the various AQMA (37 sites) and the majority (42 sites) are located at the roadside/kerbside. One monitoring site is a rural background site co-located with the Rochester Stoke continuous monitor. There are six diffusion tubes sites located to close the road improvements scheme study area. These are identified in Figure 21.
- 5.1.9 Gravesham Borough Council carries out continuous monitoring at two sites. Monitoring of NO₂ and PM₁₀ is carried out at one roadside site within the Gravesham A2 AQMA and monitoring of NO₂ and PM₁₀ at an industrial background site within the Gravesham Industrial AQMA. Monitoring of NO₂ is also carried out at 69 diffusion tube sites including nine locations within the Gravesham A2 AQMA.

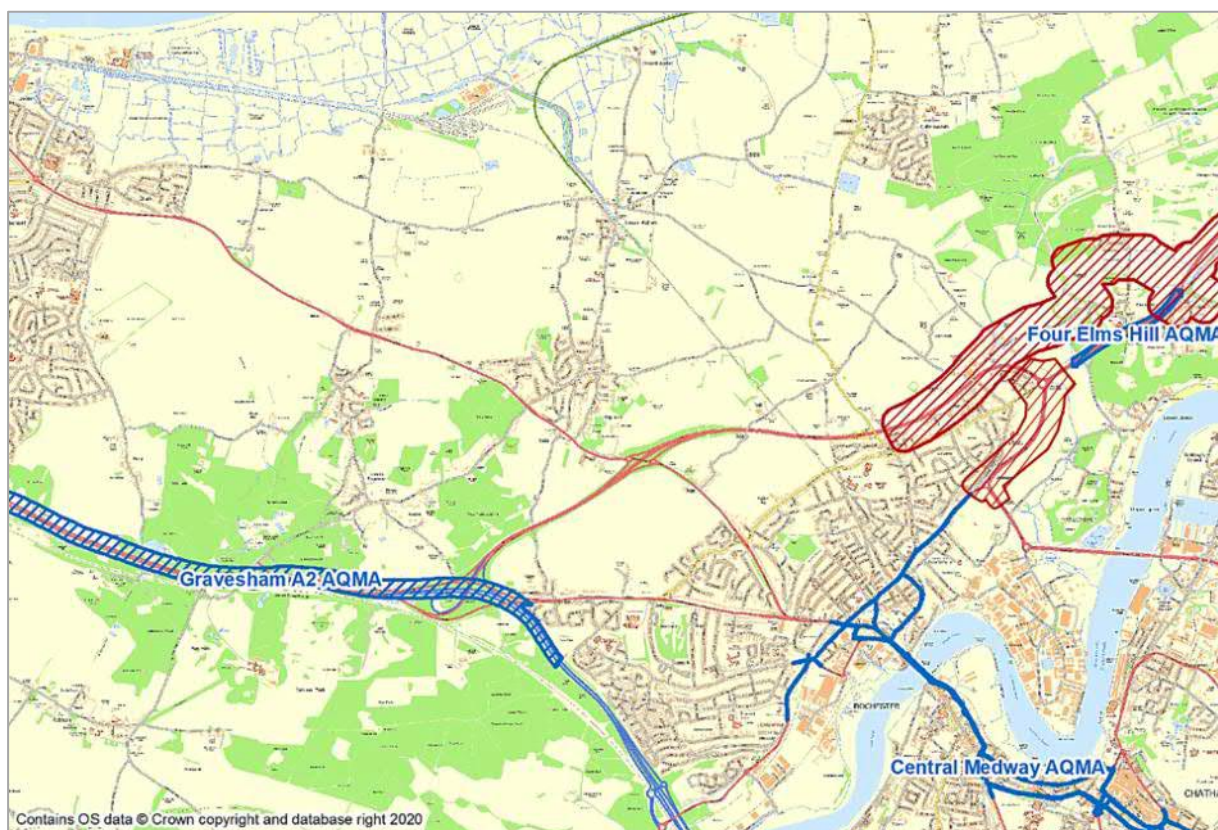


Figure 19: Location of the Gravesham A2 Air Quality Management Area

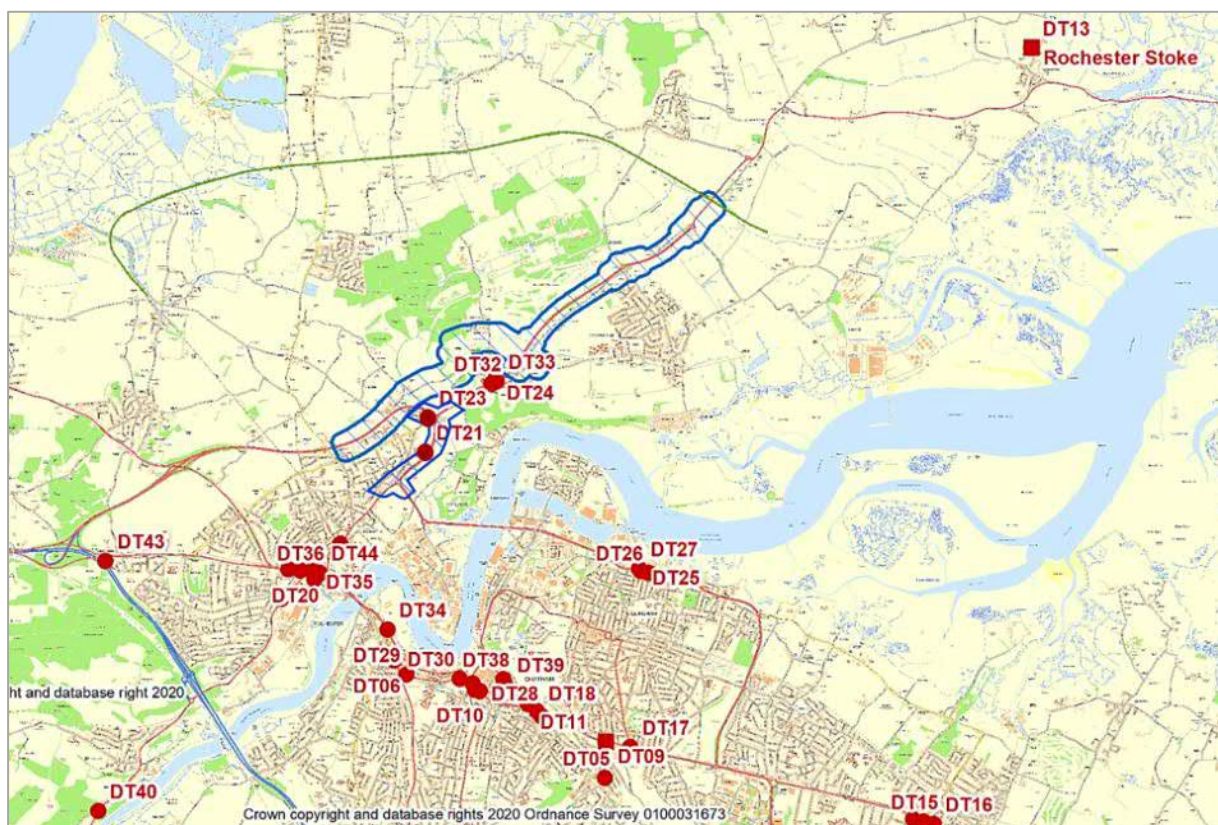


Figure 20: Air Quality Monitoring Sites within the Medway Council Area



Figure 21: Air Quality Monitoring Sites Close to the Study Area

Baseline Conditions

Nitrogen Dioxide

- 5.1.10 Concentrations of NO₂ measured at the two Medway Council continuous monitoring sites for the last three years are presented in Table 5.

Table 5: Measured Concentrations of NO₂ at Medway Council's Automatic Monitoring Sites

Pollutant/ Averaging Period	2017	2018	2019
Annual mean (µg/m³)			
Chatham (urban centre)	25.4	23.4	24.4
Rochester Stoke (rural)	14.7	13.0	12.3
Number of exceedances of the hourly AQO of 200 µg m⁻³ (18 allowed per annum)			
Chatham (urban centre)	0	0	0
Rochester Stoke (rural)	0	0	0

- 5.1.11 Annual mean concentrations for all sites and years are below the annual mean air quality objective (AQO) for NO₂ of 40 µg m⁻³. As would be expected, highest concentrations were measured at Chatham (urban centre) site and the three-year mean was 61% of the AQO. For the rural monitoring site, the mean concentration for the three years was 33% of the AQO. At

both sites, there were no exceedances of the hourly mean AQO of $200 \mu\text{g m}^{-3}$ (18 allowed per annum).

- 5.1.12 For the diffusion tube locations identified close to the road Proposed Scheme (refer Figure 21) and assessed as being characteristic of air quality around the Application Site, a summary of measured annual mean concentrations for the last three years is provided in Table 6.

Table 6: Measured Concentrations of NO_2 at Diffusion Tubes Sites Close to the Proposed Scheme

Pollutant/ Averaging Period	2017	2018	2019
Annual mean ($\mu\text{g}/\text{m}^3$)			
DT21 Spire Way, Wainscott	22.4	21.4	19.9
DT22 Joy Lodge, Four Elms Hill	31.0	28.0	27.2
DT23 Omaha Place, Wainscott	25.3	29.0	24.4
DT24 Main Road, Chattenden	50.8	47.4	53.2
DT32 Main Road Chattenden	47.5	46.3	43.1
DT33 Broadwood Road, Chattenden	43.5	41.6	42.0

- 5.1.13 Measured concentrations of NO_2 at DT21, DT22 and DT23 are well below the annual mean AQO of $40 \mu\text{g m}^{-3}$ for all three years. However, there were exceedances for all three years for the DT24, DT32 and DT33 (all located within the Four Elms AQMA). Highest concentrations were measured at DT24 (Main Road, Chattenden). The three year mean at this site was $50.5 \mu\text{g m}^{-3}$ (126% of the AQO).

Fine Particles (PM_{10} and $\text{PM}_{2.5}$)

- 5.1.14 Concentrations of PM_{10} measured at the two continuous monitoring sites are presented in Table 7 which provides annual mean concentrations and the number of 24 hour mean concentrations exceeding the daily limit of $50 \mu\text{g m}^{-3}$ (35 exceedances are allowed per annum).

Table 7: Measured Concentrations of PM_{10} at Medway Council's Automatic Monitoring Sites

Pollutant/ Averaging Period	2017	2018	2019
Annual mean ($\mu\text{g}/\text{m}^3$)			
Chatham (urban centre)	21.6	23.7	23.0
Rochester Stoke (rural)	15.8	17.4	15.0
Number of exceedances of the 24-hour AQO of $50 \mu\text{g m}^{-3}$ (35 allowed per annum)			
Chatham (urban centre)	7	11	14
Rochester Stoke (rural)	4	0	10

- 5.1.15 Measured annual mean concentrations are well below the AQO for PM_{10} of $40 \mu\text{g m}^{-3}$. As would be expected, highest concentrations were measured at the urban centre site where the three year mean of $22.8 \mu\text{g m}^{-3}$ was 57% of the AQO. The number of exceedances of the 24-hour limit was well below the 35 allowed by the AQO.

- 5.1.16 Concentrations of PM_{2.5} measured at the two continuous monitoring sites are presented in Table 8 which provides annual mean concentrations for comparison to the AQO of 25 µg m⁻³.

Table 8: Measured Concentrations of PM_{2.5} at Medway Council's Automatic Monitoring Sites

Pollutant/ Averaging Period	2017	2018	2019
Annual mean (µg/m ³)			
Chatham (urban centre)	14.1	15.2	13.7
Rochester Stoke (rural)	9.7	10.1	10.9

- 5.1.17 Measured concentrations are well below the AQO of 25 µg m⁻³. Over the three years, highest concentrations were measured at the urban centre site where the three year mean of 14.3 µg m⁻³ was 57% of the AQO of 25 µg m⁻³.

Summary of Sensitive Receptors

Human Health

- 5.1.18 The selection of sensitive receptors will be dependent on the road links included in the air quality assessment which will depend on the outcome of the traffic model. However, given the relatively poor air quality indicated by the numerous AQMA, it is anticipated that air quality assessment will need to assess the impact of additional traffic on the Central Medway AQMA, the Four Elms Hill AQMA, the Gillingham AQMA and the Gravesham A2 AQMA as a minimum. The largest increases in vehicle movements will be at the closest points of each AQMA to the improvement scheme as any increase will reduce as the additional traffic is distributed across the local road network. Therefore, these locations will be the focus of the air quality assessment for impacts on human health. Once the traffic model is available, the road links that will need to be included in the air quality model will be identified and the location of sensitive human receptors will be selected and will include those located within 200 m of the selected road links.

Habitats

- 5.1.19 There are extensive areas designated as Sites of Special Scientific Interest (SSSI) in close proximity to the Application Site and close to roads that may be affected by additional traffic on the local road network. Phase 1 (although no works are proposed outside of existing corridors) and Phase 2 of the Proposed Scheme pass through the Chattenden Woods & Lodge Hill SSSI and a part of Tower Hill to Cockham Wood SSSI is adjacent to the A289 Vanguard Way as shown in Figure 22.
- 5.1.20 Parts of the Medway Estuary & Marshes are also designated as Special Protection Areas (SPA) and Ramsar site. At the A289 (Danes Hill) these are located within 50 m of the roadside. Therefore, depending on the predicted change in traffic as a result of the scheme at these locations some distance away from the Proposed Scheme, it may be necessary to determine the impact of vehicle emissions on this sensitive European habitat site.

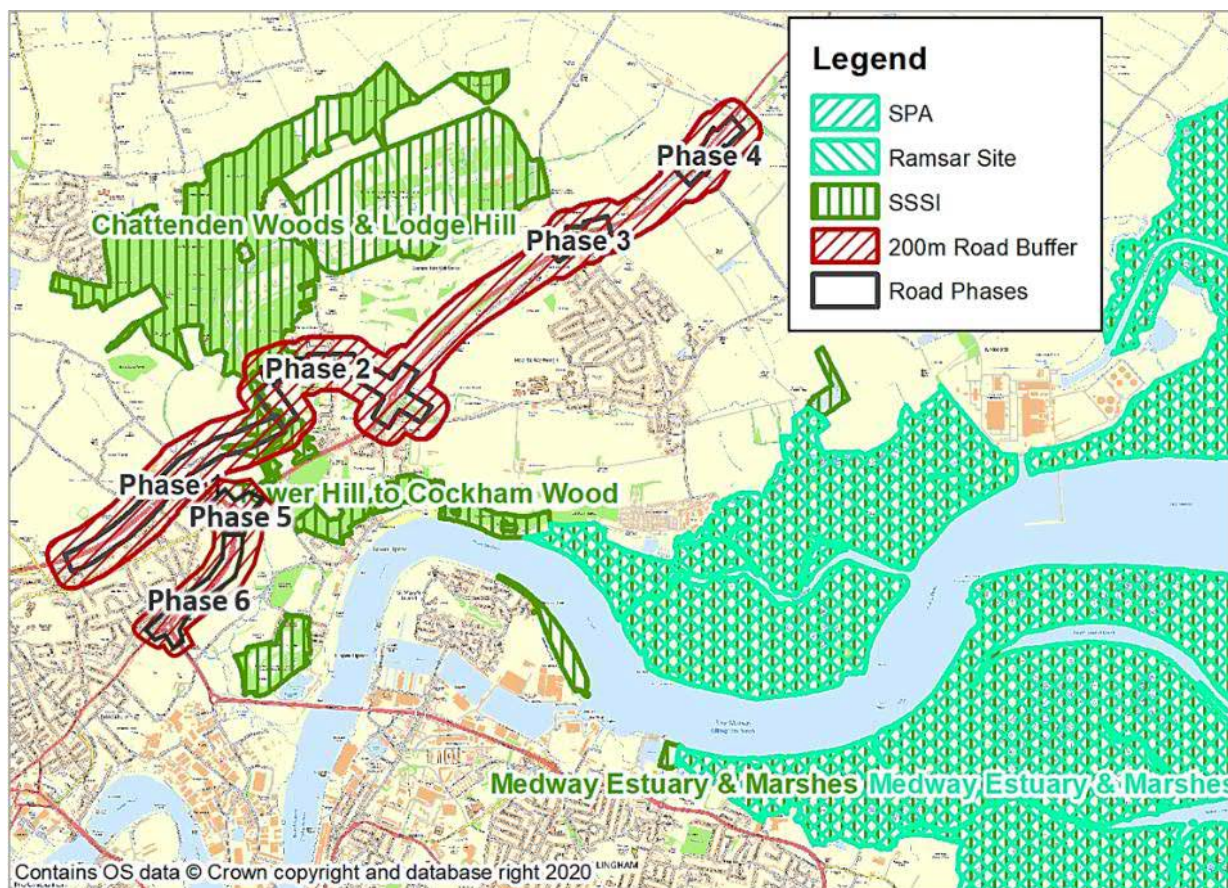


Figure 22: Habitat Sites Close to the Road Improvement Scheme

5.2. Potential Impacts of the Proposed Scheme

Construction Phase

5.2.1 Examining the Proposed Scheme, described in Chapter 2, together with the sensitive receptors identified within the Baseline Section of this chapter, we consider that the Proposed Scheme has the potential to result in the following impacts during the construction phase. We propose that these elements of assessment are scoped into the EIA:

- Construction dust resulting in potential impacts on annoyance (dust soiling), human health impacts from exposure to fine particles and the deposition of dust on habitats within nature conservation sites.
- Changes in vehicle emissions as a result of additional construction traffic on the local roads or disruption to traffic movements. The pollutants of concern are nitrogen dioxide (NO₂) and fine particles (PM₁₀ and PM_{2.5}). These have the potential to effect human health and habitat sites.

Operation and Maintenance

5.2.2 We consider that the Proposed Scheme has the potential to result in the following impacts during Operation and Maintenance:

- Changes in vehicle emissions as a result of changes to traffic flow and traffic speeds as a result of the Proposed Scheme improvements. As for construction, the pollutants of concern are nitrogen dioxide (NO₂) and fine particles (PM₁₀ and PM_{2.5}). These have the potential to effect human health and habitat sites.
- Realignment and widening of the road and associated roundabouts may bring traffic emissions closer to sensitive receptor locations.

5.2.3 The proposed road scheme will provide a bypass for the A228 that currently passes through Chattenden and which results in poor air quality. Therefore, the road scheme is likely to result in a reduction in pollutant concentrations within the Four Elms AQMA. This will be quantified.

5.2.4 Any assessment undertaken would be carried out in accordance with Medway Council's Air Quality Planning Guidance (April 2016) and Defra's Technical Guidance (TG16).

5.3. Impacts to be Scoped Out

5.3.1 There are sensitive human receptors with relevant public exposure within 200 m of the proposed road scheme. In addition, there are habitat sites immediately adjacent to the scheme. Therefore, the impact of the construction and operation of the scheme on human health and habitats should be assessed and there is no justification for scoping out impacts at this stage.

5.4. Proposed Assessment Methodology

Construction Activities

5.4.1 The impact of construction activities on local air quality arises principally from the generation of dust during construction and other activities and from construction vehicle emissions and non-road mobile machinery.

5.4.2 The impact of dust generation during construction activities will be limited to the area of the construction site and laydown areas. The impact of these on local air quality would be assessed using guidance produced by the Institute of Air Quality Management (IAQM) (June 2016). The most common air quality impacts relating to construction activities are as follows:

- dust deposition, resulting in the soiling of surfaces;
- visible dust plumes, which are evidence of dust emissions;
- elevated PM₁₀ concentrations, as a result of dust generating activities on site; and

- an increase in concentrations of airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment used on site (non-road mobile machinery, NRMM) and vehicles accessing the site.

5.4.3 The risk of dust emissions from a demolition/construction site causing loss of amenity and/or health or ecological impact is related to:

- the activities being undertaken;
- the duration of these activities;
- the size of the site;
- the meteorological conditions (wind speed, direction and rainfall);
- the proximity of receptors to the activities;
- the adequacy of the mitigation measures applied to reduce or eliminate dust; and
- the sensitivity of the receptors to dust.

5.4.4 The IAQM methodology considers four aspects that may give rise to dust emissions:

- demolition of existing structures;
- construction of the new facilities;
- earthworks; and
- 'trackout' of dust on vehicles.

5.4.5 The potential for dust emissions is assessed for each activity that is likely to take place. If an activity is not taking place (e.g. demolition) then it does not need to be assessed. The assessment methodology considers three separate dust impacts as follows:

- annoyance due to dust soiling;
- the risk of health effects due to an increase in exposure to PM₁₀; and
- harm to ecological receptors.

5.4.6 Step 1 of the IAQM Guidance is to screen the requirement for a more detailed assessment. An assessment will normally be required where there is a human receptor within:

- 350 m of the construction site boundary; or
- 50 m of a road used by construction traffic up to 500 m from the site entrance.

5.4.7 For ecological receptors, an assessment will be required where a sensitive habitat site is within:

- 50 m of the boundary of the site; or
- 50 m of a road used by construction traffic up to 500 m from the site entrance.

5.4.8 It should be noted that the criteria are deliberately conservative and detailed assessments are required for most proposed schemes, recognising that dust arising from construction activities within urban areas is a significant source of airborne particles.

5.4.9 Where appropriate, the four potential sources of dust and PM₁₀ (demolition, construction, earthworks and track-out) are considered individually, adopting the methodology in the IAQM guidance to assess the risk of dust annoyance (soiling), adverse impact on human health due to elevated PM₁₀ concentrations and adverse impact on habitat sites from dust deposition.

5.4.10 In Step 2, a site is allocated a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large; and
- the sensitivity of the area to dust impacts which is defined as low, medium or high sensitivity.

5.4.11 The dust emission magnitude is based on the scale of the anticipated works and example definitions are presented in Table 9.

Table 9: Potential Dust Magnitude

Activity	Large	Medium	Small
Demolition	Building volume >50,000 m ³ , potentially dusty construction materials, demolition at above 20 m in height	Building volume 20,000 to 50,000 m ³ , potentially dusty construction materials, demolition height 10-20 m in height	Building volume <20,000 m ³ , material with low potential for dust release, demolition height <10 m
Earthworks	Site area >10,000 m ² , potentially dusty soil type, >10 heavy earth moving vehicles, bunds >8 m in height, total material moved >100,000 tonnes	Site area of 2,500 to 10,000 m ² , moderately dusty soil type, 5-10 heavy earth moving vehicles, bunds 4-8 m in height, total material moved 20,000 to 100,000 tonnes	Site area <2,500 m ² , low dust potential soil type, <5 heavy earth moving vehicles, bunds <4 m in height, total material moved <20,000 tonnes
Construction	Total building volume >100,000 m ³ , on site concrete batching, sandblasting	Total building volume 25,000 to 100,000 m ³ , potentially dusty construction material	Total building volume <25,000 m ³ , material with low potential for dust release
Trackout	>50 outbound HGV movements in any day, potentially dust surface material, unpaved road length >100 m	10-50 outbound HGV movements in any day, moderately dusty surface material, unpaved road length 50 to 100 m	<10 outbound HGV movements in any day, surface material with low potential for dust, unpaved road length <50 m

5.4.12 The sensitivity of the area takes account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM₁₀, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

5.4.13 The IAQM document provides guidance on the categorisation of receptors into high, medium and low sensitivities for dust soiling, health effects and ecological effects. For dust soiling, the sensitivity of people and their property to soiling will depend on the level of amenity and the appearance aesthetics and value of property. For health effects from exposure to PM₁₀, sensitivity will depend on whether or not the receptor is likely to be exposed over relevant timescales to elevated concentrations over a 24-hour period. For ecological effects, the sensitivity will depend on the type of the habitat designation (e.g. European site, national or local designations) and the sensitivity of the habitat to dust deposition effects.

Vehicle Emissions from Construction Traffic

- 5.4.14 The road scheme construction activities and construction vehicle traffic movements have the potential to disrupt existing traffic on the local road network resulting in congestion and an increase in emissions which will likely lead to a deterioration in air quality around the construction sites. The impact of construction vehicle movements on the local road network can be assessed quantitatively where the number of movements are sufficiently high to have an impact on local air quality. Guidance provided by the IAQM in their planning for air quality would be used to determine if a quantitative assessment of construction traffic is required. Where required, the methodology for carrying out a construction traffic-related air quality assessment would be the same as for operational air quality (see below).
- 5.4.15 It is unlikely that there will be sufficient information available to evaluate the impact of construction on traffic disruption and congestion as information on traffic routing, road closures, temporary traffic lights etc are unlikely to be available. Therefore, it will be necessary to have a Traffic Management Plan (TMP) incorporated into the Construction Environmental Management Plan (CEMP) for the scheme. Following a qualitative review of construction activities including the location of construction compounds, sensitive locations and haul route options, recommendations for minimising impacts for areas which may be particularly sensitive (e.g. close to residential or other sensitive receptors such as habitat sites) will be proposed for inclusion in the TMP.

Vehicle Emissions During Operation of the Scheme

- 5.4.16 The assessment of operational impacts arising from the vehicle emissions on the road network for sensitive receptors identified would be determined using the ADMS Roads (Version 5.0) dispersion model and traffic data generated by the traffic model reported in the Transport Assessment. It is anticipated that data provided will include current baseline (for model verification), the Do Minimum (e.g. without the proposed road scheme improvements) for the

opening year (2024) and a future year (2039) and the Do Something (e.g. with the proposed road scheme improvements) for the opening and future year.

5.4.17 The roads included within the model will be dependent on the changes in traffic flows, average road speeds and road alignment. It is proposed that the impact on air quality should be considered for the following road links.

- Proposals will give rise to a significant change in either traffic volumes or in vehicles speeds (+/- 10 kph). For traffic volumes, a significant change would be a change in annual average daily traffic (AADT) of greater than 500 light duty vehicles (LDV) or greater than 50 heavy duty vehicles (HDV) within an AQMA or greater than 1,000 LDV or greater than 50 HDV outside of an AQMA.
- Proposals will significantly alter the traffic composition on local roads, for example, increase the number of heavy-duty vehicles.

5.4.18 Without traffic data it is not possible to determine those road links that should be considered at this stage. However, as a minimum the following should be included.

- Any new road links associated with the traffic scheme and all road links and roundabouts where there are planned improvements;
- Road links through Four Elms AQMA, Chattenden;
- Four Elms Hill;
- A289 Wulfere Way;
- A289 west of Four Elms Roundabout (Hasted Road);
- A2 Watling Street;
- A228 Frindsbury Hill (Central Medway AQMA); and
- Road links through Gillingham AQMA.

5.4.19 These are the routes directly affected by the proposed road scheme plus other routes where it is considered improvements will affect traffic flows and/or speeds. In addition, for the roundabout junctions, the impact of the additional roads feeding into the roundabouts will have an impact on air quality for receptors within close proximity to the roundabout junctions. Therefore, these roads would also be included within the assessment out to a distance of 200 m from the roundabout junction.

5.4.20 Following the delivery of the traffic model, the affected road network (road links to be included in the model) will be reviewed and where necessary additional road links included.

5.4.21 Modelling will be undertaken using meteorological data from the Southend-on-Sea meteorological observing station for the year that coincides with the most recent year of monitoring data (currently 2019). Modelling of baseline impacts will be used for model

verification using baseline concentrations obtained by Medway Council and Gravesham Borough Council, as appropriate.

- 5.4.22 Emissions for each road link will be calculated using Defra's 2020 Emission Factor Toolkit (EFT V10.0). Emissions will be calculated for the Do Minimum (DM) and Do Something (DS) scenarios. Emissions are predicted to decrease over future years as the vehicle fleet is updated with newer and more efficient emissions control technology. However, historically vehicle emissions and background concentrations in urban areas have not decreased as predicted by Defra. Therefore, a precautionary approach will be taken regarding the decrease in emissions in the future. It is proposed that for the opening year (2024), vehicle emissions and background concentrations are as predicted by Defra for 2022 and these emissions will be higher than for 2024. For the future year, a similar approach will be adopted (and agreed with relevant authorities).
- 5.4.23 Therefore, for the detailed assessment, modelling will be carried out for the following scenarios.
- Baseline scenario for model verification purposes;
 - Do Minimum and Do Something for 2024 (using 2022 emission factors and background concentrations);
 - Do Minimum and Do Something for future year (likely using 2030 emission factors and background concentrations as the Defra data does not extend beyond 2030).
- 5.4.24 Concentrations of NO₂, PM₁₀ and PM_{2.5} for the opening year (2024) and future year will be predicted for the sensitive receptors located within 200 m of the road links included in the assessment. For each receptor, the magnitude of the impact of the scheme will be determined using the IAQM planning guidance.
- 5.4.25 The impact on habitat receptors within 200 m of the road links will be assessed. Where, there are European sites or SSSI's, the assessment will consider the impact of airborne oxides of nitrogen (NO_x), nutrient nitrogen deposition and acidification. For locally designated sites, the impact of airborne concentrations of NO_x will be assessed only. The impact for each habitat will be assessed by comparison with critical levels for annual mean NO_x and 24 hour mean NO_x and site relevant critical loads for nutrient nitrogen deposition and acidification.

Assessment of Significance

- 5.4.26 A general approach for assessing the potential impacts of the scheme are set out in Section 4.3. However, guidance for assessing significance for air quality impacts is provided by the IAQM in their guidance on land-use planning and development control (January 2017). Therefore, the IAQM guidance would be used for assessing the impact of the scheme on local air quality.
- 5.4.27 The IAQM guidance provides impact descriptors for individual receptors and these are presented in Table 10. The table is intended to be used by rounding the change in percentage pollutant concentration to whole numbers. Changes of 0% (i.e. less than 0.5%) would be described as 'negligible'.

Table 10: Air Quality Impact Descriptor for Individual Receptors

Concentration with Development	Percentage Change in Air Quality Relative to the Air Quality Assessment Level (AQAL)			
	1%	2 to 5%	5 to 10%	> 10%
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76 to 94% of AQAL	Negligible	Slight	Moderate	Moderate
95 to 102% of AQAL	Slight	Moderate	Moderate	Substantial
103 to 109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

5.4.28 The impact descriptor is dependent on both the concentration with the development (i.e. existing background plus the development contribution) and the change in concentrations as a result of the development. Therefore, where the concentration with the development exceeds the air quality assessment level (AQAL) even a small contribution (i.e. 1% change will result in a 'moderate' impact). This recognises that in areas of poor air quality a small change in concentrations can have a large impact on population exposure. It should be noted that the descriptors can be beneficial (where there is a decrease in concentrations due to the development) or adverse (where there is an increase).

5.4.29 The impact descriptor is dependent on both the concentration with the development (i.e. existing background plus the development contribution) and the change in concentrations as a result of the development. Therefore, where the concentration with the development exceeds the air quality assessment level (AQAL) even a small contribution (i.e. 1% change will result in a 'moderate' impact). This recognises that in areas of poor air quality a small change in concentrations can have a large impact on population exposure. It should be noted that the descriptors can be beneficial (where there is a decrease in concentrations due to the development) or adverse (where there is an increase).

5.4.30 The assessment of significance in the context of the impact descriptor utilised, is principally left to professional opinion and guidance is provided on the factors that need to be considered when judging significance and include the following:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to impacts;
- the sensitivity of receptors;
- the worst-case assumptions adopted when undertaking the prediction of impacts; and
- the extent to which the Proposed Scheme has adopted best practice to eliminate and minimise emissions.

5.4.31 For habitat sites, the Environment Agency (EA) in their guidance on 'risk assessment for your environmental permit' specifies criteria to enable the potential significance of an impact to be determined. For European habitat sites and Sites of Special Scientific Interest (SSSI), the

impact is deemed insignificant if the annual mean process contribution (PC) is less than 1% of the critical level (or air quality objective) and the short term PC is less than 10% of the critical level (or air quality objective). If either of these criteria is exceeded, they are not necessarily significant however, it is then necessary to consider the total predicted environmental concentration or deposition (PC plus the background contribution).

5.4.32 For local wildlife sites (SINCs, SLINC's, NNRs, LNRs and ancient woodland), the EA state that a process contribution (PC) is considered not significant if:

- the long-term PC < 100% of the long-term critical level; and
- the short-term PC < 100% of the short-term critical level.

5.4.33 The IAQM has recently issued guidance on the assessment of air quality impacts on designated nature conservation sites (June 2019). It is the IAQM's opinion that the Environment Agency's 1% and 10% screening criteria should not be used rigidly and 'not to a numerical precision greater than the expression of the criteria themselves'. Furthermore, the IAQM guidance suggests that LWS should be treated in the same manner as SSSIs and European sites 'although the determination of the significance of an effect may be different'.

5.5. Assumptions and Limitations

5.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.

5.5.2 The scope of work for assessing air quality impacts is based on preliminary information at this stage and will be revised once improved design information and traffic modelling is available (e.g. road traffic generated by the road improvement scheme and the distribution of traffic across the local road network).

5.5.3 It has been assumed that the traffic model will result in a reduction in traffic passing through the Four Elms AQMA and will result in a benefit within Chattenden. However, it will be necessary to confirm that this is the case once the traffic model is available.

5.5.4 It is assumed that the standard IAQM dust measures will be put in place and these will be taken into account in the assessment.

5.6. References

- 2020 Air Quality Annual Status Report (ASR), Medway Council (June 2020)
- Air Quality Planning Guidance, Medway Council (April 2016)
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites, IAQM (June 2019)

- Environment Agency Risk Assessment Guidance at <https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit>
- Guidance on the Assessment of Dust from Demolition and Construction, IAQM (June 2016)
- Land-Use Planning & Development Control: Planning for Air Quality, IAQM (January 2017)
- Local Air Quality Management Technical Guidance (TG16) (February 2018)

6. Noise and Vibration

6.1. Scoping Baseline

- 6.1.1 It is considered likely that the existing and future acoustic environment in the vicinity of the Proposed Scheme is dominated by road traffic noise from the A228 and A289, both of which are identified as major noise sources under the Environmental Noise (England) Regulations 2006, as presented by Defra Strategic Noise Mapping.
- 6.1.2 The area is also likely to experience some commercial sound from local businesses and aircraft noise to a lesser extent. Rail traffic noise from the existing London to Grain rail line may also be observable, however this is not shown to be a major noise source by the Strategic Noise Mapping.
- 6.1.3 The closest dwellings to the Application Site are located along the A228 and/or the A289 in the vicinity of the villages of Wainscott, Chattenden, High Halstow and Hoo. The Strategic Noise Mapping indicates that road traffic noise contributions at the closest dwellings to these roads are in the region of 70 – 74.9 dB $L_{Aeq,16hr}$. Noise levels exceed 55 dB $L_{Aeq,16hr}$ for dwellings within approximately 400m north and south of the A228, and within approximately 300m from the A289. Noise levels increase in the vicinity of the junction of the A228 and the A289, where a combined road traffic noise impact is evident. Noise levels exceed 55 dB $L_{Aeq,16hr}$ within approximately 600m of the roads this area, which are located north and south east of Wainscott.
- 6.1.4 The following presents previously collected noise data from locations in the vicinity of the Proposed Scheme. This data has been sourced from publicly available planning application documents.

Data Review Bells Lane, Hoo (Planning Application ref: MC171884)

- 6.1.5 A noise survey was undertaken in July 2016 as part of a noise impact assessment (report ref.38353/3001 Rev 02, dated August 2016) for a proposed residential development at Bells Lane, Hoo (Planning Application ref MC171884). Measured noise levels in this area may be considered representative of sensitive receptors in the northern part of Hoo, closest to the A228. The noise monitoring locations are shown on Figure 23, below.



Figure 23: Noise monitoring locations published within the Bells Lane, Hoo Planning Application (ref: MC171884)

6.1.6 The table below provides a summary of the measured noise levels at Locations LT1 – LT4.

Table 11: Summary of Measured Environmental Sound Survey Results at Bells Lane, Hoo

Location	Date	Period, T	$L_{Aeq,T}$ dB	Typical* L_{AFMax} dB	Typical $L_{A90,T}$ dB
LT1	14/07/2016	Night-time (23:00-07:00 hours)	51	67	30
	15/07/2016	Daytime (07:00-23:00 hours)	56	70	51
		Night-time (23:00-07:00 hours)	50	72	34
	16/07/2016	Daytime (07:00-23:00 hours)	55	71	50
		Night-time (23:00-07:00 hours)	48	66	33
	17/07/2016	Daytime (07:00-23:00 hours)	54	73	50
		Night-time (23:00-07:00 hours)	51	68	28
LT2	14/07/2016	Night-time (23:00-07:00 hours)	53	77	35
	15/07/2016	Daytime (07:00-23:00 hours)	61	84	54
		Night-time (23:00-07:00 hours)	55	81	43
	16/07/2016	Daytime (07:00-23:00 hours)	59	85	52
		Night-time (23:00-07:00 hours)	52	79	43
	17/07/2016	Daytime (07:00-23:00 hours)	60	84	50

Location	Date	Period, T	L _{Aeq,T} dB	Typical* L _{AFMax} dB	Typical L _{A90,T} dB
		Night-time (23:00-07:00 hours)	54	80	32
LT3	14/07/2016	Night-time (23:00-07:00 hours)	61	81	37
	15/07/2016	Daytime (07:00-23:00 hours)	67	90	53
		Night-time (23:00-07:00 hours)	59	82	41
	16/07/2016	Daytime (07:00-23:00 hours)	65	89	50
		Night-time (23:00-07:00 hours)	59	81	41
	17/07/2016	Daytime (07:00-23:00 hours)	65	91	48
		Night-time (23:00-07:00 hours)	60	83	34
LT4	14/07/2016	Night-time (23:00-07:00 hours)	52	71	36
	15/07/2016	Daytime (07:00-23:00 hours)	56	73	52
		Night-time (23:00-07:00 hours)	53	76	30
	16/07/2016	Daytime (07:00-23:00 hours)	54	74	50
		Night-time (23:00-07:00 hours)	49	70	38
	17/07/2016	Daytime (07:00-23:00 hours)	54	75	49
		Night-time (23:00-07:00 hours)	51	74	32
*Based on the 10 th highest measured L _{Amax} level					

Data Review: Ratcliffe Highway, Hoo St Werburgh (Planning Application ref.MC183663)

- 6.1.7 Noise measurements were also undertaken in June 2018 as part of a noise assessment (report ref.GM10040/001 dated December 2018) for a proposed residential development on land off Ratcliffe Highway, Hoo St Werburgh (Planning Application ref.MC183663). Measured noise levels in this area may be considered representative of sensitive receptors in the northern/north western part of Hoo, closest to the A228. The noise monitoring locations are shown in the noise assessment report on drawing GM10040-002 'Noise Monitoring Locations', presented in Figure 24 for reference.



Figure 24: Noise monitoring locations published within the Ratcliffe Highway, Hoo St Werburgh Planning Application (ref.MC183663)

- 6.1.8 The table below provides a summary of the measured noise levels at Location ML1. Measured levels at ML2 were used to assess industrial noise and therefore have not been presented here.

Table 12: Average Daytime and Night-time Noise Levels for Land off Ratcliffe Highway

Monitoring Location	Start Date and Time	Finish Date and Time	Average Daytime Noise Levels (07:00-23:00)	Average Night-time Noise Levels (23:00-07:00)	10 th Highest Maximum Night-time Noise Level
ML1	11/06/2018 20:14	12/06/2018 13:00	59	53	75

- 6.1.9 It can be seen that the measured levels in 2016 and 2018 show daytime noise levels to be in the region of 59-60 dB $L_{Aeq,16hr}$ and night-time noise levels to be in the region of 53-55 dB $L_{Aeq,8hr}$ at the closest monitoring locations to the A228 (based on LT2 from 2016 survey and ML1 from 2018 survey). These locations appear to be a similar distance from the A228, in the northern area of Hoo.

Data Review: Four Elms Hill, Chattenden (Planning Application ref.MC183245)

- 6.1.10 A noise survey was undertaken in October 2017 as part of a noise assessment (report ref. 171001/2, dated 6 November 2018) for a proposed residential development at Four Elms Hill, Chattenden (Planning Application ref.MC183245). Noise monitoring was undertaken at 1No. location, an existing dwelling north of the A228. Measured levels at this location give an indication of the noise levels experienced by dwellings in this area.
- 6.1.11 The noise monitoring location is shown on Figure 25 of the noise assessment report, presented below for reference.



Figure 25: Noise monitoring locations published within the Four Elms Hill, Chattenden Planning Application (ref.MC183245)

- 6.1.12 Paragraph 6.4 of the Four Elms Hill noise assessment report states that “the overall road traffic noise level at the measurement position was 62.6 dB $L_{Aeq,16hour}$ during the day, and was 56.7 dB $L_{Aeq,8hour}$ at night”.

Summary of Data Review Findings

- 6.1.13 In summary, based on the data sources outlined above, it is apparent that the baseline acoustic environment at the nearest noise sensitive receptors to the Proposed Scheme is heavily dominated by road traffic noise. The level of road traffic noise is elevated in areas close to the A228, with the greatest increase noted in the vicinity of the junction of the A228 and the A289, where a combined road traffic noise impact is evident.

- 6.1.14 The study area will be determined following methods consistent with the assessment of previous UK infrastructure schemes.

Summary of Sensitive Receptors

- 6.1.15 The noise and vibration assessment will consider the key potential noise and vibration effects associated with the Proposed Scheme. It is anticipated that the assessment will consider the likely significant effects associated with the development on:

- Residential receptors and amenity – dwellings, communities and open areas; and
- Non-residential receptors – including, community educational and healthcare facilities, places of worship, offices and other commercial facilities.

- 6.1.16 From the baseline information presented above, the following sensitive receptors have initially been identified within the study area and could be impacted by the Proposed Scheme:

- Existing dwellings in Wainscott, north and south of the A289 Hasted Road;
- Wainscott Primary School;
- Existing dwellings on Islingham Farm Road;
- Wainscott Camp (MOD);
- Existing dwellings in Chattenden, north and south of the A228;
- Chattenden Primary School;
- Existing dwellings in Hoo St Werburgh;
- Existing dwellings in High Halstow and Sharnal Street;
- Lodge Hill and Chattenden Woods SSSI; and
- Cockham Wood SSSI.

- 6.1.17 Sensitive receptors will be confirmed once the study area has been determined.

6.2. Potential Impacts of the Proposed Scheme

Construction Phase

- 6.2.1 Examining the Proposed Scheme, described in Chapter 2, together with the initial consideration of sensitive receptors identified within the Baseline Section of this chapter, we consider that the Proposed Scheme has the potential to result in the following impacts during the construction phase.

6.2.2 We propose that these elements of assessment are scoped into the EIA:

- Noise and vibration effects from construction activities, such as material movements, earthworks, ground improvement and piling, crushing and breaking;
- Ground-borne noise and vibration effects due to high energy construction activities, including piling works;
- Noise effects from construction vehicle movements to and from the Application Site; and
- Project-wide combined noise effects.

Operation and Maintenance

6.2.3 We consider that the Proposed Scheme has the potential to result in the following impacts during the Operation and Maintenance. We propose that these elements of assessment are scoped into the EIA:

- Impact of operational road traffic noise on sensitive receptors.

6.3. Impacts to be Scoped Out

6.3.1 The Proposed Scheme is unlikely to result impact upon the following. It is proposed that these elements are scoped out of the EIA

- Impact of operational vibration on sensitive receptors
Justification: No material sources of vibration are expected to be included as part of the Proposed Scheme.

6.4. Proposed Assessment Methodology

Baseline Methodology

6.4.1 The approach to establishing baseline conditions to inform the noise assessment will consist of baseline noise measurements at locations which are considered to be representative of the existing acoustic environment at the nearest noise-sensitive receptors to the Proposed Scheme.

Construction Noise and Vibration

6.4.2 The definition of appropriate assessment criterion and noise metrics for the purpose of identifying likely significant effects will take into account national policies, standards and guidance.

6.4.3 The spatial extents of the proposed study area for the construction noise and vibration assessment are consistent with those adopted in recent major infrastructure projects, including

High Speed 2 (Phases 1 and 2a) and Heathrow Expansion. The proposed spatial extents of the study area are:

- 300m: noise from construction activities, such as material movements, earthworks, ground improvement and piling, crushing and breaking;
- 100m: ground-borne vibration from high energy construction activities, including piling works; and
- 1dB change: noise effects from construction vehicle movements to and from the construction site likely to result in a change of 1 dB $L_{Aeq,T}$ or greater.

6.4.4 Construction noise predictions will be carried out in accordance with guidance contained in BS 5228-1:2009+A1:2014, which will also be used to inform assessment and significance criterion. Calculations will be informed by indicative plant lists, working methods and proposed phasing plans.

6.4.5 The consideration of construction ground-borne vibration effects, such as those associated with high-impact activities, shall be considered using criteria advocated in BS 5228-2:2009+A1:2014, and other vibration related standards and guidance (e.g. Guide to Evaluation of Human Exposure to Vibration in Buildings: Vibration Sources Other than Blasting, 2008 and BS 7385-2: 1993 Evaluation and measurement for vibration in buildings: Part 2 Guide to damage levels from ground-borne vibration, 1993).

6.4.6 The calculation and measurement of road traffic flows for the purpose of informing the construction noise assessment will use the procedures described in the Department of Transport's 'Calculation of Road Traffic Noise' (CRTN, 1988), and assessment criterion informed by Highways England 'LA 111 Noise and vibration' (LA111, 2019). Noise modelling will be used to assess changes in road traffic noise and the significance of effects will be determined based on change and absolute level of noise exposure using a policy-led approach.

Operational Road Traffic Noise

6.4.7 The assessment years for the operational noise assessments will be aligned with those detailed in Section 4: Proposed EIA Methodology. Further assessment years may be considered within the noise chapter depending upon the forecast noise impacts of the Development.

6.4.8 The assessment will be undertaken in line with national policies, namely the Noise Policy Statement for England (NPSE, 2010), taking into account relevant policies, standards and guidance (including NPPF, 2019, PPG(N), 2019, IEMA Guidelines for Environmental Noise Impact, 2014, WHO Guidelines for Community Noise, 1999, WHO Night Noise Guidelines, 2009, and WHO Environmental Noise Guidelines for the European Region, 2018). Criteria will be developed to determine significance based on absolute levels of and changes in noise exposure with respect to relevant policy thresholds and guidance.

6.4.9 Noise associated with changes in road traffic noise due to changes to the new / altered local road infrastructure and future operational traffic flows will be calculated in line with guidance

presented in CRTN (1988) and assessed in accordance with the assessment criterion provided by Highways England 'LA 111 Noise and vibration' (LA111, 2019).

Assessment of Significance: Construction Noise and Vibration Impacts upon Residential Receptors

- 6.4.10 The determination of effect thresholds for the construction noise assessment is based upon the methodologies presented within Annex E of BS 5228-1:2009+A1:2014 'ABC Method', as summarised in Table 13.

Table 13: Construction Noise (Fixed and Mobile Plant) – 'ABC Method' Noise Thresholds

Noise Source	Receptor	Period	Category A	Category B	Category C
Construction noise	Residential	Daytime	65 dB L	70 dB L	75 dB L
	Residential	Evening	55 dB L	60 dB L	65 dB L
	Residential	Night	45 dB L	50 dB L	55 dB L
Clarifications and notes:					
Daytime: Weekdays (0700-1900hrs) and Saturdays (0700-1300hrs)					
Evening: Weekdays (1900-2300hrs), Saturdays (1300-2300hrs), Sundays and Bank Holidays (0700-2300hrs)					
Night-time: Weekdays, Weekends and Bank Holidays (2300-0700hrs)					
*Rounded to the nearest 5 dB					

- 6.4.11 The Category A noise thresholds are assumed to align with the Lowest Observed Adverse Effect Level (LOAEL) as they are the lowest threshold in the 'ABC Method' criteria.
- 6.4.12 The Category C noise thresholds are assumed to align with a Significant Observed Adverse Effect Level (SOAEL) and is an approach consistent with other major infrastructure projects, namely: Thames Tideway Tunnel; Crossrail; and High Speed 2 (HS2) Phase 1 and 2a.
- 6.4.13 The daytime Category C (SOAEL) threshold of 75 dB $L_{Aeq, 12hr}$ is taken from the Committee on the Problem of Noise: Noise report (Wilson, 1963) and was set to avoid interference with normal speech indoors.
- 6.4.14 The evening Category C (SOAEL) is set at 10 dB lower than the day-time criteria, based upon advice presented within the Department of the Environment Advisory Leaflet 72 – Noise Control on Building Sites (AL 72, 1976).
- 6.4.15 The night-time Category C (SOAEL) of 55 dB $L_{Aeq, 8hr}$ is consistent with advice presented within the WHO Night Noise Guidelines for Europe (WHO NNG, 2009).
- 6.4.16 The UAEL thresholds were based upon the BS 5228-1:2009+A1:2014 requirements for temporary rehousing, associated with construction activities of 10 or more days of working in any 15 consecutive days, or for 40 or more days in any six consecutive months, and set at 10 dB above the SOAEL.
- 6.4.17 The construction noise assessments thresholds of potential effect criteria are summarised in Table 14 below.

Table 14: Thresholds of Potential Effect Criteria (outdoor, free-field noise levels unless otherwise stated)

Noise Source	Period	LOAEL	SOAEL	UAEL
Construction noise	Daytime	65 dB L	75 dB L	85 dB L
	Evening	55 dB L	65 dB L	75 dB L
	Night	45 dB L	55 dB L	65 dB L

6.4.18 Where Proposed Scheme related noise exposures are shown to be lower than the LOAEL values in Table 14, a significant effect in terms of the EIA Regulations will not be deemed to occur at residential receptors.

6.4.19 Development related noise exposures which fall between LOAEL and SOAEL have the potential to constitute a significant effect, subject to additional considerations, namely:

- The level of noise exposure;
- The change in the noise exposure as a result of the Proposed Scheme; and
- The population experiencing such change and exposure to noise as a result of the Proposed Scheme.

Noise Exposure Classifications

6.4.20 Table 15 provides noise level categories between the LOAEL and UAEL thresholds. Greater weight in terms of significance evaluation has been given to higher noise levels, even when occurring between the same thresholds, i.e. LOAEL and SOAEL.

Table 15: Noise Level Categories

Noise Level	Construction Noise		
	Daytime	Evening	Night-time
Very Low	<65dB L	<55dB L	<45dB L
LOAEL			
Low	66-68dB L	56-58dB L	46-48dB L
Medium	69-71dB L	59-61dB L	49-51dB L
High	72-74dB L	62-64dB L	52-54dB L
SOAEL			
Very High	>75dB L	>65dB L	>55dB L
UAEL			
Unacceptable	>85dB L	>75dB L	>65dB L

Magnitude of Change in Noise Exposure

6.4.21 The magnitude of change in noise exposure will not be considered as part of the construction noise assessment given there are no permanent construction related activities associated with the Proposed Scheme.

Construction Vibration

- 6.4.22 The effect of human exposure to vibration from sources other than blasting is covered in BS 6472:2008. The standard provides guidance for predicting human response to vibration in buildings over the frequency range of 0.5 Hz to 80 Hz. It presents frequency-weighting curves for humans exposed to whole-body vibration, advice on measurement methods and methods for assessing continuous, intermittent and impulsive vibrations.
- 6.4.23 BS 6472:2008 uses the vibration dose value (VDV $\text{ms}^{-1.75}$) to determine the effect of vibration on human receptors within the buildings, as “[p]resent knowledge shows that this type of vibration is best evaluated with the vibration dose value (VDV).” As noted in BS 5228-2:2009:A1:2014, for construction it is considered more appropriate to consider effects of vibration levels in terms of Peak Particle Velocity (PPV mms^{-1}).
- 6.4.24 The use of the PPV metric is also consistent with the guidance within BS 7385:1993, which presents assessment criteria to be applied for the likelihood of cosmetic damage to buildings.
- 6.4.25 Table 16 provides presents a summary of the assessment criteria given in terms of human building response, derived based on guidance within BS 5228-2:2009:A1:2014 and BS 7385:1993.

Table 16: Vibration limits for human response and building (cosmetic) damage

Vibration Limit PPV mms^{-1}	Effect	Magnitude of Impact
< 0.14	Vibration unlikely to be perceptible	None
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration	Negligible
0.30	Vibration might be just perceptible in residential environments	Minor
1.00	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given the residents	Moderate
7.50	Guide value for cosmetic damage of residential buildings where dynamic loading may lead to resonance	Significant
10.00	Vibration is likely to be intolerable for any more than a very brief exposure to these levels in most building environments	Unacceptable

- 6.4.26 A significant effect from construction vibration will be deemed to occur where there is an exceedance of a magnitude of impact of 1.00 mms^{-1} PPV during the daytime, or 0.30 mms^{-1} PPV during the night-time periods.

Construction Road Traffic Noise

- 6.4.27 The assessment criteria to be used in the construction traffic assessment is consistent with the operational road traffic noise assessment, as summarised in Table 18.

- 6.4.28 Noise exposure classifications and magnitude of change in noise exposure categories are also consistent with the operational road traffic noise assessment, as summarised in Table 19 and Table 20.

Assessment of Significance: Construction Noise and Vibration impacts upon Non-Residential Receptors

- 6.4.29 The assessment of construction noise and vibration at the residential receptors is considered likely to be worst-case, and therefore no assessment of non-residential receptors is proposed.

Assessment of Significance: Operational Road Traffic Noise impacts upon Residential Receptors

- 6.4.30 The assessment criteria is primarily based on the Lowest Observed Adverse Effect Levels (LOAELs) and Significant Observed Adverse Effect Levels (SOAELs) as set out within Design Manual for Roads and Bridges: Sustainability & Environment Appraisal LA 111 Noise and vibration (LA 111, 2020).
- 6.4.31 UK policy does not define daytime or night-time Unacceptable Adverse Effect Level (UAEL) values for road traffic noise. The assessment has assumed UAEL values based on advice set out within BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings (BS 8233, 2014) and ProPG: Planning & Noise – Professional Practice Guidance on Planning & Noise (ProPG, 2017).
- 6.4.32 It has been assumed that the target internal noise levels, as set out in BS 8233 (2014) would be deemed unacceptable once exceeded by 10 dB or more. It has also been assumed that 26 dB is a reasonable and conservative assumption for the outdoor to indoor level difference. This represents the level difference expected for a property with a masonry construction and single glazed (closed) windows.
- 6.4.33 The derivation of the UAEL values from the BS 8233 (2014) daytime and night-time target internal noise levels is presented in Table 17.

Table 17: Road Traffic Noise – UAEL Threshold Derivation

Noise Source	Period	BS8233(2014) Target Internal Noise Level	Unacceptable Noise Level (Internal)	Unacceptable Noise Level (UAEL) (External)
Operational Road Traffic	Daytime	35 dB $L_{Aeq,16hr}$	45 dB $L_{Aeq,16hr}$	71 dB $L_{Aeq,16hr}$
	Night	30 dB $L_{Aeq,8hr}$	40 dB $L_{Aeq,8hr}$	66 dB $L_{Aeq,8hr}$

- 6.4.34 A summary of the assessment criteria to be used to assess road traffic noise is given in Table 18. Whilst LA 111 specifies night-time criteria as L_{night} and the derived UAEL is in terms of $L_{Aeq,8hr}$, for the road traffic assessment these are considered to be equivalent as they have both been determined in relation to annual average road traffic flows.

Table 18: Road Traffic Noise Thresholds of Potential Effect Criteria (outdoor, free-field noise levels unless otherwise stated)

Noise Source	Period	LOAEL	SOAEL	UAEL
Operational Road Traffic	Daytime	55 dB L _{A10,18hr} (façade)	68 dB L _{A10,18hr} (façade)	71 dB L _{Aeq,16hr}
	Night	40 dB L _{night, outside}	55 dB L _{night, outside}	66 dB L _{Aeq,8hr}

6.4.35 Where Proposed Scheme related noise exposures are shown to be lower than the LOAEL values in Table 18, a significant effect in terms of the EIA Regulations shall be deemed not to occur at residential receptors.

6.4.36 Proposed Scheme related noise exposures which fall between LOAEL and SOAEL have the potential to constitute a significant effect in EIA terms, subject to additional considerations, namely:

- The level of noise exposure;
- The change in the noise exposure as a result of the Proposed Scheme; and
- The population experiencing such change and exposure to noise as a result of the Proposed Scheme.

Noise Exposure Classifications

6.4.37 Table 19 provides noise level categories between the LOAEL and UAEL thresholds. Greater weight in terms of significance evaluation will be given to higher noise levels, even when occurring between the same thresholds, i.e. LOAEL and SOAEL.

Table 19: Noise Level Categories

Noise Level	Operational Road Traffic	
Very Low	<55dB L	<40dB L
LOAEL		
Low	55-59dB L	40-45dB L
Medium	60-63dB L	46-49dB L
High	64-67dB L	50-54dB L
SOAEL		
Very High	>=68dB L	>=55dB L
UAEL		
Unacceptable	>=71dB L	>=66dB L
(f) - facade		

Magnitude of Change in Noise Exposure

6.4.38 A beneficial change will be deemed to occur where there is a reduction in noise level, and an adverse change will be where there is an increase.

- 6.4.39 With reference to LA111 (2020) methodology, where the magnitude of change in the short term is negligible at noise sensitive receptors, it shall be concluded that the noise change will not cause changes to behaviour or response to noise and therefore will not lead to a likely significant effect.
- 6.4.40 Where the magnitude of change in the short term is greater or equal to 1 dB(A), the final significance will be determined by consideration of local circumstances, as advised within LA 111(2020).
- 6.4.41 The road traffic change in noise level criteria are for both short term and long term impacts, derived from methodologies advocated in LA 111 (2020), as summarised in Table 20.

Table 20: Change in Noise Level Categories

Noise Change Category	Road Traffic Noise
Negligible	<1 dB
Low	1 – 2.9 dB
Medium	3 – 4.9 dB
High	5 – 10 dB
Very High	>10 dB

Assessment of Significance: Operational Road Traffic Noise impacts upon Non-Residential Receptors

- 6.4.42 Table 21 summarises the noise impact criteria for the non-residential receptors. For all noise related impact criteria for non-residential receptors, there is an additional requirement that the exposure changes by 3 dB or more.

Table 21: Change in Noise Level Categories

Non-residential Receptor Group	Daytime 0700-2300hrs Impact Criterion (dB L _{Aeq,16h})	Night-time 2300-0700hrs Impact Criterion (dB L _{Aeq,8h})	Reference
Place of Worship	50*	Not Applicable	BS 8233:2014
Educational	50*	Not Applicable	BB93:2015
Healthcare	55*	50*	HTM08-01:2013
*and a change of >3 dB			
Note: Suitable criteria will be considered on a case-by-case basis for any other types of non-residential use identified during the EIA if not included in the list above.			

6.5. Assumptions and Limitations

- 6.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.

- 6.5.2 The construction noise and vibration assessments are limited by the information provided regarding proposed plant, working methods and phasing.
- 6.5.3 The operational road traffic noise assessment is limited by the traffic data provided for use in the calculations.
- 6.5.4 All assumptions and limitations identified throughout the EIA process will be reported within the Noise and Vibration ES Chapter.

6.6. References

- British Standards Institute. BS 5228:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' Part 1: Noise, 2014
- British Standards Institute. BS 5228:2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites' Part 2: Vibration, 2014
- British Standards Institute. BS 6472-1:2008 Guide to Evaluation of Human Exposure to Vibration in Buildings: Vibration Sources Other than Blasting, 2008
- British Standards Institute. BS 7385-2: 1993 Evaluation and measurement for vibration in buildings: Part 2 Guide to damage levels from ground-borne vibration, 1993
- Department for Environment, Food and Rural Affairs. Noise Policy Statement for England, 2010
- Calculation of Road Traffic Noise (CRTN), this document was published in 1988 and is not available electronically, however a summary is available in: Highways Agency, Design Manual for Roads and Bridges, Vol. 11, Section 3, Part 7, August 1994.
- Highways England, Sustainability & Environment Appraisal LA 111 Noise and vibration, Rev. 0, 2019
- Department for Communities and Local Government (DCLG). National Planning Policy Framework, 2012
- Planning Practice Guidance Noise – PPG(N) 2014
- Institute of Environmental Management & Assessment (IEMA). Guidelines for Environmental Noise Impact Assessment v 1.2 2014
- World Health Organisation. Community Noise Guidance 1999
- World Health Organisation. Night Noise Guidelines 2009
- World Health Organisation. Environmental Noise Guidelines for the European Region 2018

7. Nature Conservation

7.1. Scoping Baseline

- 7.1.1 This chapter is supported by environmental constraints mapping presented in Appendix A. The Proposed Scheme has not been subject to ecological assessment. This scoping chapter has been informed by the following standalone ecological assessment reports which pertain to developments in the vicinity of the Proposed Scheme:

Ecological Surveys undertaken for the proposed Highways Improvements

- Great Crested Newt Habitat Suitability and eDNA Sampling, CSA Environmental (2020) (report presented in Appendix B).

East of Phase 2

- 7.1.2 A previous planning application was made in 2019 by Taylor Wimpey UK Ltd for Land West of Hoo St Werburgh, Kent. This site is located to the east of Phase 2 of the proposed highway improvements. The following assessments reports have been referenced to provide an ecological baseline for the wider landscape within the vicinity of Phase 2 of the proposed scheme:

- Preliminary Ecological Appraisal. Ref: CSA/3529/01;
- Environmental Statement Ecology Appendix 8.1: Bat Survey Report. CSA/3529/05;
- Environmental Statement Ecology Appendix 8.2: Water Vole Survey Report. CSA/3529/06;
- Environmental Statement Ecology Appendix 8.3: Badger Survey Report. CSA/3529/07;
- Environmental Statement Ecology Appendix 8.4: Breeding Bird Survey Report. CSA/3529/08;
- Environmental Statement Ecology Appendix 8.4: Wintering Bird Survey Report. CSA/3529/09;
- Environmental Statement Ecology Appendix 8.6: Reptile Survey Report. CSA/3529/10; and
- Environmental Statement Ecology Appendix 8.7: GCN Survey Report. CSA/3529/11.

Phases 3 and 4

- 7.1.3 The following reports have been produced by Pell Frischmann for the proposed Rail Infrastructure Improvements. Parts of these reports relate to stretched of the line within close proximity to Phases 3 and 4 of the proposed highway improvements. These reports are presented in Appendix B:

- Breeding Bird Survey Report - 103223-PEL-G3-H01-REP-EVV-0003;

- Wintering Bird Survey Report - 103223-PEL-G3-H01-REP-EVV-0004;
- Water Vole Survey Report - 103223-PEL-G3-H01-REP-EVV-0006; and
- Great Crested Newt Survey Report - 103223-PEL-G3-H01-REP-EVV-0007.

7.1.4 In addition to the reports listed above, this chapter also references the preliminary findings of the following surveys undertaken by Pell Frischmann for the proposed rail infrastructure improvements:

- Preliminary Ecological Appraisal;
- Bat Survey; and
- Badger Survey.

7.1.5 The findings of these surveys have been reference has they provide ecological data for land around Phase 4 of the Proposed Scheme.

Nature Conservation Designations

On-Site Designations

7.1.6 The Application Site is overlapped by one statutory designation for nature conservation:

- Chattenden Woods and Lodge Hill Site of Special Scientific Interest (SSSI). This SSSI is predominantly located beyond 300m to the north of Phase 2 and to the north west of Phase 3. Phases 1 and Phase 2 of the Proposed Scheme will bisect the SSSI at the narrowest point of the SSSSI between Chattenden (to the south) and Great Chattenden Woods and Cliffe Woods to the north, although no works outside of the existing highway boundary are currently anticipated.

Off-Site Designations

7.1.7 Other statutory designations for nature conservation within 2km of the proposed scheme (as shown in the ecological constraints plans in Appendix A) include:

- Tower Hill to Cockham Wood SSSI – approximately 0.4km to the south of Phase 2;
- Dalham Farm SSSI – approximately 1.4km north-west of Phase 4;
- Medway Estuary and Marshes SSSI, Special Protection Area (SPA) and Ramsar Site – approximately 1.2km to the south of Phase 2 and 1.5km to the south of Phase 4;
- Northward Hill National Nature Reserve (NNR)– approximately 1.6km north-west of Phase 4; and
- Medway Estuary Marine Conservation Zone (MCZ) – approximately 650m to the south of Phase 2.

7.1.8 Non-statutory designations for nature conservation within 2km of the Proposed Scheme (as shown in the ecological constraints plans in Appendix A) include:

- The London Area Greenbelt (Gravesham District) – approximately 0.6km to the west of Phase 1;
- Northward Hill (RSPB Reserve) – approximately 1.5km to the north-west of Phase 4; and
- North Kent Marshes Environmentally Sensitive Area – approximately 1.7km to the north of Phase 4.

7.1.9 There were a number of Ancient Woodlands within 2km of the Proposed Scheme. The closest of these formed parts of the Chattenden Woods and Lodge Hill SSSI and overlap with the northern part of the Phase 2 works at Round Top Wood, to the north of Chattenden, although no tree removal is currently anticipated at this location. Other notable areas of woodland within 2km of each phase included:

- Phase 1 – no ancient woodland within 2.0km;
- Phase 2 - Cockham Wood approximately 550m to the south;
- Phase 3 - two patches of Ancient Woodland within Deangate Wood 300m north of the Proposed Scheme; and
- Phase 4 - Fisher's Wood, approximately 1.0km to the north-east.

Habitats

7.1.10 Seven UK Biodiversity Action Plan (BAP) habitats have been identified within the Proposed Scheme and the surrounding 2km buffer, which include:

- Rivers and streams;
- Arable field margins;
- Hedgerows;
- Broadleaved woodland;
- Traditional orchards;
- Coastal and floodplain grazing marsh; and
- Intertidal mudflats.

7.1.11 Good quality semi-improved grassland (non-priority) habitat and other habitats within land classified as having no main habitat have also been identified within 2km of the Proposed Scheme.

- 7.1.12 A brief description of the habitats encountered per proposed phase of works is provided below. The presence of these habitats has been established from GIS, satellite imagery and mapping. No direct walkover of the Proposed Scheme has been undertaken at the time of writing.

Highway Improvement Phase 1:

- 7.1.13 Phase 1 is located to the north of the existing urban area of Wainscott, with the Proposed Scheme area to the north and south of the existing A289 road corridor. The southern area of the Phase comprised the urban area of Wainscott and as such there was limited greenspace other than residential back gardens, trees and hedgerows lining the road and agricultural fields to the north of the Phase 1 boundary area. To the north of the existing road corridor, to the north-east of Wainscott, the area becomes more rural with agricultural fields and an area of priority habitat deciduous woodland.

Highway Improvement Phase 2:

- 7.1.14 Phase 2 is within a more rural location than Phase 1 and passes through predominantly agricultural fields and woodland. Deciduous woodland is present to the north and west of the phase boundary. The proposed Relief Road will cut across the agricultural land and an area of derelict land which was formerly Chattenden Barracks (according to a 1:25,000 OS map from 1945-1969). Towards the east of the phase boundary, along the A228 Peninsula Way, habitats include hedgerows and lines of trees surrounding the road.

Highway Improvement Phase 3:

- 7.1.15 This phase of the works covers part of the A228 Peninsula Way and the Bells Lane Roundabout. This phase is dominated by habitats typical of linear roads, including hedgerows, and areas of trees between slip roads. To the north of the A228 the area is predominantly agricultural fields while to the south is a mix of fields and residential development.

Highway Improvement Phase 4:

- 7.1.16 Phase 4 is located along part of the A228 Peninsula Way around the Ropers Lane Roundabout. The habitats mostly include hedgerows and areas of trees surrounding the road, as well as agricultural fields to the north and south of the road.

Highway Improvement Phases 5 and 6:

- 7.1.17 Phases 5 and 6 are located along the A289 Wulfere Way and Four Elms Roundabout. The habitats here are dominated by the road, as well as trees and hedgerows on either side of the road. To the north of Wulfere Way is predominantly land used for residential purposes, with some green spaces used for recreation. To the south and east are agricultural fields.

Protected Species

- 7.1.18 Table 22 outlines protected species surveys undertaken within the vicinity of the Site.

Table 22: Findings of Protected Species Surveys

Species	Survey Type	Report Ref:	Overview of Nearby Survey Results
Badgers	Preliminary Ecological Appraisal – walkover survey	CSA/3529/07; and PF preliminary survey findings (rail infrastructure)	<p>Phase 2</p> <p>Badger Activity was noted within the boundary of the Taylor Wimpey proposed housing development, with a partially used sett approximately 0.8km from Phase 2 of the Proposed Scheme.</p> <p>Phase 3 and 4</p> <p>Badger setts and foraging activity have been identified within a commutable distance of these phases as part of the ecological assessment for the Rail Scheme.</p> <p>Habitats have been identified from satellite imagery that are suitable for badgers including a railway corridor, field margins and a golf course.</p>
Bats	Bat Survey Reports	CSA/3529/05; and PF preliminary survey findings (rail infrastructure)	<p>Habitats suitable for foraging and commuting bats have been identified along hedgerows, woodlands, and watercourses in proximity to the proposed phases.</p> <p>Bat activity surveys undertaken as part of the neighbouring Taylor Wimpey and rail development schemes have identified species of bats using the existing rail corridor for foraging or commuting including common, Nathusius and soprano pipistrelle, noctule, serotine and Leisler's, Daubenton's and brown long-eared bats. All phases of the Proposed Scheme are considered to be within the range of these bats.</p>
Birds	Breeding Bird Surveys; Wintering Bird Surveys	CSA/3529/08 and CSA/3529/09; 103223-PEL-G3-H01- REP-EVV-0003	<p>In total 52 bird species were observed during the surveys, of which 16 are considered 'notable species' which refers to those that appear on the Birds of Conservation Concern (BoCC) Red List or are listed within the Wildlife and Countryside Act Schedule 1 Part 1 or the UK's Biodiversity Action Plan (BAP).</p>

Species	Survey Type	Report Ref:	Overview of Nearby Survey Results
Great Crested Newts	eDNA surveys, Presence/Absence Surveys, Population Assessments	CSA/3529/11; 103223-PEL-G3-H01-REP-EVV-0007	<p>Ponds and open water bodies are present within 500m of the Application Site which could be suitable for GCN and common amphibians.</p> <p>According to the Kent GCN Risk Zone, parts of Phase 1, Phase 2 and Phase 3 are within the amber zone and Phase 4 is within the green zone. According to Natural England, amber zones contain main population centres for GCN and contain important connecting habitat whereas green zones comprise of sparsely distributed GCN and the likelihood of the zone containing key habitat connections is low.</p> <p>There are a number of data records for GCN within the proximity of the development phases. The Taylor Wimpey GCN report identified great crested newt breeding ponds both north and south of the A228 indicating that GCN are present across the landscape; while surveys undertaken as part of the rail scheme identified several ponds with GCN present to the north west of Phase 4.</p> <p>In addition to the ponds surveyed by Taylor Wimpey, CSA Environmental were commissioned in July 2020 to undertake an assessment of the presence / likely absence of great crested newts within six additional ponds within close proximity to Phases 1 and 2 of the Proposed Scheme. The eDNA results identified the presence of GCN in three of the six pond. The findings are presented in Appendix B).</p>
Reptiles	Feasibility Study Walkover; Presence/ Likely Absence Surveys	CSA/3529/10;	<p>Habitats likely to be suitable for reptiles have been identified within the Application Site and ecological zone of influence. It is therefore considered likely that common reptile species will be present within the habitats that bound the existing road network, including field margins, hedgerows and golf course.</p> <p><i>Phase 2</i></p> <p>Surveys of the Taylor Wimpey Site identified a high population of slow worm and a low population of common lizard; including species found within the boundary of Phase 2 of the Proposed Scheme.</p> <p><i>Phase 4</i></p> <p>The presence of common lizard and grass snake have been identified through surveys associated with the rail development to the north of Phase 4. It is considered likely that reptile species are present throughout the Site as railway embankments provide a suitable matrix of habitats for them to shelter and bask.</p>

Species	Survey Type	Report Ref:	Overview of Nearby Survey Results
Water Voles	Presence/ Absence Surveys and River Surveys	CSA/3529/06; 103223-PEL-G3-H01- REP-EVV-0006	<p><i>Phase 2</i></p> <p>Possible water vole burrows were noted along a watercourse to the east of the A228, located within the northern extent of Phase 2 of the Proposed Scheme.</p> <p><i>Phase 4</i></p> <p>A number of water courses including drains and small streams were identified in relation to the nearby Rail Scheme which at various points provided suitable habitat for water voles. A number of data records for water voles have also been returned and water vole burrows and latrines were identified within wet ditches to the west of Ratcliffe Highway.</p>

Sensitive Receptors

7.1.19 From the baseline information presented above, the following sensitive receptors have been identified within the study area and could be impacted by the Proposed Scheme:

- Nature conservation designations within 2km of the Proposed Scheme;
- Habitats within 500m of the proposed scheme footprint (including proposed construction footprint). From satellite imagery these habitats appear to include the following, though further survey would be required to inform these:
 - Broadleaf Scattered Trees;
 - Semi-Natural Broadleaf Woodland;
 - Scrub;
 - Tall ruderal vegetation;
 - Standing water including wet ditches;
 - Arable Vegetation;
 - Improved Grassland; and
- Populations of protected species within 2km of the proposed scheme including:
 - Foraging and commuting bats;
 - Badgers;
 - Breeding birds;
 - GCN terrestrial and breeding habitat;
 - Reptiles;
 - Water voles;
 - Wintering birds.

7.2. Potential Impacts of the Proposed Scheme

Construction Phase

7.2.1 Examining the Proposed Scheme, described in Chapter 2, together with the initial consideration of sensitive receptors identified within the Baseline Section of this chapter, we consider that the Proposed Scheme has the potential to result in the following impacts during the construction phase. We propose that these elements of assessment are scoped into the EIA:

- loss/change of habitat types including hedgerows, woodland, semi-mature and mature trees arable land and grassland within the development scheme;
- the loss of GCN terrestrial habitat and potential loss of GCN breeding habitat;

- the loss of habitat for breeding and overwintering birds;
- disturbance to bats through loss of roosting opportunities and foraging habitat
- Impacts to water vole habitat including burrow locations;
- Impacts to reptile individuals and habitats supporting populations;
- contamination of water bodies from construction runoff;
- direct impacts to areas of Chattenden Woods and Lodge Hill SSSI;
- indirect impacts to protected sites: the Application Site is within a number of SSSI impact risk zones including Tower Hill to Cockham Wood, Medway Estuary and Marshes and Dalham Farm; and
- impacts from dust and noise and vibration on other designated sites (in liaison with the relevant air quality and noise and vibration specialists). It is anticipated that these effects will be assessed within the Air Quality and Noise and Vibration Chapters and referenced within the Nature Conservation chapter.

Operation and Maintenance

7.2.2 We consider that the Proposed Scheme has the potential to result in the following impacts during the Operation and Maintenance. We propose that these elements of assessment are scoped into the EIA:

- permanent loss of habitats within the area of the proposed scheme;
- permanent loss of breeding and foraging habitat for protected species including bats, breeding birds and GCN;
- permanent loss of connective corridors for commuting protected species including bats, breeding birds and GCN;
- increased disturbance and effects of increased vehicles traffic; and
- additional habitat management requirements required for road schemes.

7.3. Impacts to be Scoped Out

7.3.1 The Proposed Scheme is unlikely to result in impacts upon the following. It is proposed that these elements are scoped out of the EIA:

- Impacts upon Tower Hill to Cockham Wood SSSI, Dalham Farm SSSI, Medway Estuary and Marshes SSSI, Medway Estuary MCZ, Northward Hill NNR.
 - The proposed scheme will not result in the loss of this habitat.

- At a distance of over 700m from the Proposed Scheme for each of the above Sites, the proposed highway improvement works are unlikely to impact upon the integrity of habitats for which these sites have been designated and there is no connectivity/ecological linkages with the locations closer to the Scheme.
- Given the nature, distance and scale of the proposed highway improvements, it is unlikely that Proposed Scheme will significantly increase levels of disturbance at either of these sites.
- It is therefore proposed that impacts upon Tower Hill to Cockham Wood SSSI, Dalham Farm SSSI, Medway Estuary and Marshes SSSI, Medway Estuary MCZ and Northward Hill NNR are scoped out of the EIA.

7.4. Proposed EIA Methodology

Ecological Impact Assessment

Guidance

- 7.4.1 The assessment of construction and operational impacts upon habitats and protected species will be based upon the published methods for Ecological Impact Assessment (EclA) which is presented in CIEEM guidelines (2018 V1.1).

Zone of Influence and Proposed Study Area

- 7.4.2 Considering the receiving environment and the potential impacts of the Proposed Scheme, the ecological ZOI for the project is considered to be:
- Main ZOI: Up to 500m from the Application Site. This ZOI will be used for the assessment of habitat suitability for protected species.
 - Broad ZOI: 2km from the Application Site. This ZOI is used for a desk study of international and national statutory nature conservation designations, non-statutory nature conservation designations and records of protected and/or notable habitats and species.

- 7.4.3 The proposed study areas to be applied to EIA will be consistent with the ZOI listed above.

Impact Assessment Methodology

- 7.4.4 The baseline conditions included within the technical chapter will be informed by the findings of the Ecological Appraisal and Protected Species Surveys reports undertaken to date by Pell Frischmann, although it is anticipated that additional survey work will be required to cover all Phases of the Proposed Scheme.
- 7.4.5 As a result of field surveys and ecological data gathered, the ecological features will be evaluated in terms of their nature conservation value (using the criteria set out by CIEEM 2018 V1.1). Where features have been assigned values at more than one level, their importance will be taken at the highest level.

7.4.6 When considering changes and impacts on ecosystem structure and function, the following parameters will be considered, in line with CIEEM, 2018 (V1.1) –

- Whether the significant effect is adverse or beneficial;
- Magnitude of the significant effect;
- Extent of area affected by the significant effect;
- Duration of the significant effect;
- Reversibility of the significant effect; and
- Timing and frequency of the activity (e.g. in relation to the bird nesting season).

Assessment of Significance

7.4.7 The CIEEM guidelines consider the above range of parameters when determining the overall impact, rather than using a traditional matrix assessment of significant effects. This enables the ecological impacts to be assessed alongside other environmental impacts.

7.4.8 As a result of field surveys and ecological data gathered, the ecological features were evaluated in terms of their nature conservation value (using the criteria set out by CIEEM).

7.4.9 The value of an ecological resource has been determined within a defined geographical context as defined below in Table 23. The following frame of reference will be used: International; UK; National (e.g. England); Regional (e.g. The South East); County (e.g. Kent); District/Local (e.g. Hoo); Local; and within Zone of Influence (e.g. within the site).

Table 23: Criteria for assessing asset value in the assessment of Nature Conservation

Value	Description of value / sensitivity
Very High	High importance and rarity. International scale and limited potential for substitution i.e. site, habitat or populations of species, of international importance.
High	High importance and rarity, national scale or regional scale with limited potential for substitution i.e. site, habitat or populations of species, of national importance.
Medium	High or medium importance or rarity, local or regional scale and (limited) potential for substitution i.e. site, habitat or population of species, of regional importance. Includes high quality undesignated and designated sites, e.g. where a County-designated site is below SSSI standard but still recognised as being significant in the context of the wider region.
Low	Low or medium importance and rarity, district or local scale i.e. site, habitat or species, of importance in the context of district or local scale areas.
Negligible	A resource that is of little/no intrinsic nature conservation. Very low importance and rarity.

7.4.10 To determine the likely impacts, a range of descriptors are used (as per CIEEM guidance) including the extent or geographic impact, the magnitude, duration and frequency of impact, the reversibility of the impact, and whether the impact is temporary or permanent.

7.4.11 Typical descriptors of impacts are presented in Table 24.

Table 24: Typical descriptors of Impacts

Descriptor	Definition
Extent	The spatial or geographic area over which the impact/effect may occur
Magnitude	The 'size', 'amount', 'intensity' and 'volume'. Magnitude should be quantified where possible e.g. the amount of habitat loss, percentage change to habitat loss, percentage change to habitat area and percentage decline in species.
Duration	Relation to ecological characteristics (such as a species' lifecycle) as well as human timeframes. The duration of an activity may differ from the duration of the resulting effect caused by the activity.
Frequency and timing	The number of times an activity occurs will influence the resulting effect. The timings of an activity or change may result in an impact if it coincides with critical life-stages or seasons.
Reversibility	Irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is possible or which may be counteracted by mitigation.

7.4.12 The significance of effects is described by CIEEM as 'an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. A significant effect is a positive or negative ecological effect'.

7.4.13 To determine significance, the following considerations should be given –

- Will any of the key processes or characteristics be removed or changed within a designated site, or will there be any effect on the nature, extent, structure or function of the component habitats or population of species?
- Consideration to the conservation status of the habitat or species should be given – for example how may the scheme change the extent or structure of a species or habitat over a given geographical area?

7.4.14 Whilst it is recognised that CIEEM discourages the use of a matrix, Table 25 is included below in order to provide some examples for the reader as to the differences in significance, for example between a large adverse effect and a moderate adverse effect. Note that this is included as a guide only and does not form the backbone to any assessment that will be undertaken in the ES.

Table 25: Criteria for assessing effect significance in the assessment of Nature Conservation

Value	Description of Effect Significance
Large	<p>The proposal (either on its own or with other proposals) may adversely affect the integrity of the feature, in terms of the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest. Loss of favourable conservation status (FCS) of a legally protected species or site. Loss or damage to a population of nationally rare or scarce species.</p> <p>Examples include death of a population, destruction of habitat, prevention of breeding, permanent population isolation and/or destruction of a food supply</p>
Moderate	<p>The feature's integrity will not be adversely affected, but the effect on the feature is likely to be significant in terms of its ecological objectives. If, in the light of full information, it cannot be clearly demonstrated that the proposal will not have an adverse effect on integrity, then the impact should be assessed as major adverse. Loss of a key feature of local importance.</p> <p>Examples include reduction in size of a population, reduction in the size of available habitat and/or food supply, and/or restriction of access to further habitats.</p>
Slight	<p>Temporary disturbance to a site of county value but no permanent damage. A minor impact on legally protected species but no significant habitat loss or reduction in FCS. A minor impact on populations of nationally rare or scarce species or species which are notable at a regional or county level.</p> <p>Examples include small scale reduction in size of a large population, Slight restriction of local population range in an abundant species, disturbance but not destruction of access to further habitats.</p>
Neutral	<p>No effects on sites of international, national or county importance. Temporary disturbance or damage to a small part of features of local importance. Loss of or damage to land of negligible nature conservation value.</p>

7.5. Assumptions and Limitations

- 7.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.
- 7.5.2 The ecological baseline surveys detail the conditions and species identified from available desk study information relating to the Proposed Scheme and its vicinity. Most species are highly mobile and therefore the dynamic nature of the natural environment will result in changes to the surrounding environment as seasons change. Where this is possible to quantify, it will be included in the future baseline considerations of the ES.
- 7.5.3 To date, no ecological survey information of the Proposed Scheme has been made available and therefore additional impacts could be identified.

7.6. References

- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.
- CSA Environmental (Oct 2019) Environmental Statement Ecology Appendix 8.1: Bat Survey Report (report ref: CSA/3529/05)
- CSA Environment (Oct 2019) Environmental Statement Ecology Appendix 8.2: Water Vole Survey Report (report ref: CSA/3529/06)
- CSA Environment (Oct 2019) Environmental Statement Ecology Appendix 8.3: Badger Survey Report (report ref: CSA/3529/07)
- CSA Environment (Oct 2019) Environmental Statement Ecology Appendix 8.4: Breeding Bird Survey Report (report ref: CSA/3529/08)
- CSA Environment (Oct 2019) Environmental Statement Ecology Appendix 8.5: Wintering Bird Survey Report (report ref: CSA/3529/09)
- CSA Environment (Oct 2019) Environmental Statement Ecology Appendix 8.6: Reptile Survey Report (report ref: CSA/3529/10)
- CSA Environment (Oct 2019) Environmental Statement Ecology Appendix 8.7: Great Crested Newt Survey Report (report ref: CSA/3529/11)
- Defra MAGIC Mapping Service <https://magic.defra.gov.uk/MagicMap.aspx>
- National Library of Scotland Ordnance Survey 1:25,000 maps of Great Britain, 1945-1969 <https://maps.nls.uk/view/95750345>
- Natural England Open Data GCN Risk Zones (Kent) <https://naturalengland-defra.opendata.arcgis.com/datasets/gcn-risk-zones-kent#:~:text=GCN%20Risk%20Zones%20%28Kent%29%20This%20dataset%20identifies%20areas,development%20is%20likely%20to%20have%20on%20this%20species>
- Pell Frischmann Technical Report 103223-PEL-G3-H01-REP-EVV-0003 Breeding Bird Survey Report (2020)
- Pell Frischmann Technical Report 103223-PEL-G3-H01-REP-EVV-0004 Wintering Bird Survey Report (2020)
- Pell Frischmann Technical Report 103223-PEL-G3-H01-REP-EVV-0006 Water Vole Survey Report (2020)
- Pell Frischmann Technical Report 103223-PEL-G3-H01-REP-EVV-0007 Great Crested Newt Survey Report (2020)

8. Historic Environment

8.1. Baseline Conditions

- 8.1.1 This chapter has been prepared in accordance with the guidance contained in the recently revised DMRB guidance document LA 106 – Cultural Heritage Assessment (Revision 1 January 2020) formerly HA 208/07, HA 60/92 & HA 75/01.
- 8.1.2 Baseline data has been collated from Medway Council's online heritage resources (including Heritage Asset mapping and 2017 Heritage Asset Review), Kent County Council online Heritage mapping, Historic England's 'Heritage Gateway' database and Historic England's Hoo Peninsula Historic Landscape Project.
- 8.1.3 A study area of 1km has been chosen for designated assets, and a study area of 500m has been deemed appropriate for non-designated assets.

Designated Assets

- 8.1.4 The National Planning Policy Framework (MHCLG 2019, 66) defines Designated Assets as being World Heritage Sites, Scheduled Monuments, Listed Buildings, Protected Wreck Sites, Registered Parks and Gardens, Registered Battlefields and Conservation Areas. These Designated Assets are all afforded some extent of protection, either formally or informally.
- 8.1.5 There are no World Heritage Sites, Registered Battlefields or Protected Wreck Sites within 5km of the Proposed Scheme. Whilst no Registered Parks and Gardens are located within immediate vicinity of the Proposed Scheme, the nearest Registered Park and Garden; The Officers' Terrace, the Historic Dockyard, Chatham; is located approximately 1.8km south of Phase 5/6 of the Proposed Works.
- 8.1.6 Regarding Scheduled Monuments, there are none within the immediate vicinity of the scheme. The nearest; Beacon and pillbox on Beacon Hill; is situated approximately 515m south-east of Phase 1 of the Proposed Works. Approximately 815m east of Phase 5/6 is the artillery castle at Upnor.
- 8.1.7 The Proposed Scheme is not located within any Conservation Areas. The nearest three areas are (i) Frindsbury and Manor Farm (located immediately to the west of Sans Pareil Roundabout within Phase 5/6) (ii) Upnor (located approximately 750m south-east of Phase 5/6); and (iii) St. Mary Hoo (located approximately 2.5km to the north-east of Phase 4).
- 8.1.8 Three Grade I Listed Buildings, 46 Grade II Listed Buildings and two Grade II* Listed Buildings are located within 1km of the Proposed Scheme. These are listed within Table 26.

Table 26: Identified Listed Buildings within 1km of the Application Site

Name of Listed Building	Grade	Location
Upnor Castle	Grade I	Approximately 865m south-east of Phase 5/6
The Barracks, High Street, Upper Upnor	Grade I	Approximately 850m south-east of Phase 5/6
Manor House	Grade I	Approximately 420m south-west of Phase 5/6
Stone House Farmhouse	Grade II	Approximately 725m north-west of Phase 1
Brickhouse Farmhouse	Grade II	Approximately 590m north-west of Phase 1
Sole Street Farm House	Grade II	Approximately 240m north-west of Phase 1
Tudor Cottage	Grade II	Approximately 215m south-west of Phase 1
Royal Oak Public House	Grade II	Approximately 425m south of Phase 1
Vine Cottage	Grade II	Approximately 730m south of Phase 1
Cypress House	Grade II	Approximately 730m south of Phase 1
Red House	Grade II	Approximately 835m south of Phase 1
Ship's Figurehead from the Arethusa	Grade II	Approximately 710m south of Phase 2
Boundary Stone (Old London Stone), Upnor	Grade II	Approximately 725m south of Phase 2
Obelisk (New London Stone), Upnor	Grade II	Approximately 730m south of Phase 2
Building 106, WW1 Sentry Post, Chattenden Ordnance Depot	Grade II	Approximately 350m north of Phase 2
Two WWI Sentry Posts	Grade II	Approximately 480m north of Phase 2
Building 127, WW1 Sentry Post, Chattenden Ordnance Depot	Grade II	Approximately 630m north of Phase 2
Building 67, WW1 Sentry Post, Lodge Hill	Grade II	Approximately 645m north of Phase 2
Mill House	Grade II	Approximately 650m east of Phase 2
Building 219, WW1 Sentry Post, Lodge Hill	Grade II	Approximately 665m north of Phase 3
Four Pillboxes	Grade II	Approximately 455m south of Phase 3
Wall NE of Upnor Castle	Grade II	Approximately 880m south-east of Phase 5/6
WW1 Sentry Post	Grade II	Approximately 825m south-east of Phase 5/6
Traverse to Shifting House	Grade II	Approximately 850m south-east of Phase 5/6
Upnor Castle House	Grade II	Approximately 750m south-east of Phase 5/6
3 High Street, Upper Upnor	Grade II	Approximately 760m south-east of Phase 5/6
12-18 High Street, Upper Upnor	Grade II	Approximately 795m south-east of Phase 5/6
Castle House & Albermarle House, 19-21 High Street, Upper Upnor	Grade II	Approximately 810m south-east of Phase 5/6
Waterhouse Cottage, 25-27 High Street, Upper Upnor	Grade II	Approximately 820m south-east of Phase 5/6

Name of Listed Building	Grade	Location
Tudor Rose Public House, 29 High Street, Upper Upnor	Grade II	Approximately 835m south-east of Phase 5/6
Walsall House, 40 High Street, Upper Upnor	Grade II	Approximately 835m south-east of Phase 5/6
Waterside Cottage, 36 High Street, Upper Upnor	Grade II	Approximately 835m south-east of Phase 5/6
30-32 High Street, Upper Upnor	Grade II	Approximately 825m south-east of Phase 5/6
Tudor Cottage, 130 Cooling Road, Wainscott	Grade II	Approximately 750m north-west of Phase 5/6
Royal Oak Public House	Grade II	Approximately 630m north-west of Phase 5/6
Vine Cottage, 229 Frindsbury Hill, Wainscott	Grade II	Approximately 230m west of Phase 5/6
Cypress House, 227 Frindsbury Hill, Wainscott	Grade II	Approximately 260m west of Phase 5/6
The Red House, 195 Frindsbury Road, Wainscott	Grade II	Approximately 475m west of Phase 5/6
84 Frindsbury Road, Wainscott	Grade II	Approximately 830m west of Phase 5/6
82/82A Frindsbury Road, Wainscott	Grade II	Approximately 840m west of Phase 5/6
80 Frindsbury Road, Wainscott	Grade II	Approximately 850m west of Phase 5/6
Church of English Martyrs	Grade II	Approximately 915m west of Phase 5/6
Old Parsonage, All Saints	Grade II	Approximately 650m south-west of Phase 5/6
Moulding Tomb, All Saints	Grade II	Approximately 700m south-west of Phase 5/6
Miller Monument, All Saints	Grade II	Approximately 720m south-west of Phase 5/6
Boghurst Tomb, All Saints	Grade II	Approximately 710m south-west of Phase 5/6
12 no. headstones, All Saints	Grade II	Approximately 710m south-west of Phase 5/6
Manor Farm Oast	Grade II	Approximately 420m south-west of Phase 5/6
Barn at Manor Farm	Grade II	Approximately 415m south-west of Phase 5/6
Magazine, Upnor Depot	Grade II*	Approximately 850m south-east of Phase 5/6
All Saints Parish Church	Grade II*	Approximately 695m south-west of Phase 5/6

Non-designated Assets

- 8.1.9 Non-designated assets are an important element of the Cultural Heritage resource (DMRB 2019, 6), despite the fact that they are not formally protected.
- 8.1.10 Based on current information and the Medway 2017 Heritage Assets Review, there are 13 potential undesigned heritage assets within 500m of the Proposed Scheme. There are also

13 buildings or structures within 500m that are considered for inclusion on a Local List. The mapping suggests there may be some overlap between the undesignated assets and those that are considered for inclusion on a Local List.

- 8.1.11 The 2017 Heritage Assets Review also refers to Kent Garden Trust reports undertaken in the Medway region. One of the areas mentioned is Broomhill Park, which is located approximately 1km south-west of Phase 1. The Assets Review also refers to sites identified within the Defence of Kent Project which do not currently wholly benefit from national designation. One of the sites includes the Royal School of Military Engineering (RSME) Chattenden and Lodge Hill Camp which is situated north of the Proposed Scheme. Lochat Road and Upchat Road, which are partially located within Phase 1 and Phase 2 of the Proposed Works, are classed as belonging to the Defence of Kent Project. To the east of Lodge Hill Camp, part of the Defence of Kent Project land crosses part of Phase 4, near Sharnal Street.
- 8.1.12 The Kent County Council online Heritage mapping also identifies 87 archaeological sites and buildings in close vicinity to all five of the proposed phases. These are classified as monuments, farmsteads and buildings (non-listed) on the mapping key.
- 8.1.13 There are 12 National Monuments Record (NMR) Excavation Index sites within 500m of the five phases (2 by Phase 1, 4 by Phase 3, 1 by Phase 4 and 5 by Phase 5/6). The excavation sites have recorded evidence from the Late Bronze Age, the Iron Age, Roman, Saxon, early medieval and post-medieval periods. A site at Four Elms Roundabout recorded evidence of a Roman temple, shrine and corn drying kiln.
- 8.1.14 A search within the Kent HER (Historic Environment Record) on the Heritage Gateway revealed around 100 records across the five phases. These include historic evidence from across a range of archaeological periods, from Mesolithic and Neolithic times to WW2. A Cultural Heritage Assessment completed by Amey for Medway Council in 2016 for Four Elms Roundabout to Medway Tunnel (report ref: CO04500055/CH Revision 1) noted that they were 48 undesignated cultural heritage assets from the Heritage England HER within 300m of the that scheme.

Hoo Peninsula Historic Landscape Project

- 8.1.15 Historic England recognises the Hoo Peninsula as a historic landscape full of archaeology and buildings which reflect the area's industrial, military and agricultural past.
- 8.1.16 Between 2009 and 2012 English Heritage (now Historic England) carried out the Hoo Peninsula Historic Landscape Project. The project was influenced by the European Landscape convention and the project aimed to increase knowledge and understanding of the historic environment of the Hoo Peninsula, capturing how its history and archaeology contributed to the character of the modern landscape, including the estuarine and marine environments.
- 8.1.17 The Hoo Peninsula Historic Landscape Project used a variety of approaches to analyse the peninsula's landscape, including:
- A palaeoenvironmental review;
 - Analysis, interpretation and mapping of the peninsula's archaeological sites and landscapes that can be seen on aerial photographs;

- Ground-based survey and analysis of key sites such as Cooling Radio Station and Cliffe Explosives Works;
- A series of Outline Historic Area Assessments to investigate the peninsula's buildings and villages, such as High Halstow;
- Historic Seascape, Farmstead and Landscape Characterisations, to capture how the character of the modern landscape, farmsteads and marine / estuarine environments reflect the area's historic development.

8.1.18 The findings of this assessment are summarised within English Heritage research report No. 21-2013.

8.2. Potential Impacts of the Proposed Scheme

Construction Phase

- 8.2.1 The cultural heritage resource is defined as comprising a building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest (Highways England 2019a, 6). The impacts of highway construction and operation on the cultural heritage resource may include physical impacts leading to the partial or complete removal of individual or groups of assets or impacts on their settings or amenity values.
- 8.2.2 Physical impacts can result in the partial or complete removal of a heritage asset during construction, and such impacts would be long-term and negative in nature. These impacts can include the removal or destruction of archaeological deposits, the compaction of archaeological deposits by construction traffic and structures, and changes in groundwater levels leading to the drying out of waterlogged archaeological deposits. Impacts on the setting of heritage assets can also result from construction, and again, in most cases, these impacts would be long-term and negative in nature. Such impacts can include the interruption or improvement of important views to or from an asset, the introduction or removal of large, prominent or intrusive structures within the setting of an asset, the introduction or removal of visual intrusion (such as moving vehicles, the presence of road signs or lighting etc), significant changes in noise, dust, odour or air quality affecting the appreciation of their archaeological context, and severance or restoration of relationships between associated assets. These impacts would start during construction and continue during operation, although the degree of impact may vary between phases.
- 8.2.3 There are also likely to be potential additional impacts on the cultural heritage resource arising from factors relating to construction, such as construction compounds, locations of spoil heaps, haul routes, noise and dust, service diversions etc.
- 8.2.4 Examining the Proposed Scheme, described in Chapter 2, together with the initial consideration of sensitive receptors or assets identified within the Baseline Section of this chapter, we consider that the Proposed Scheme has the potential to result in impacts to the assets listed above during the construction phase. In the majority of cases, the impacts are likely to be low, as only relatively small parts of the assets should be affected, comparative to their overall size or area. We proposed that these elements of assessment are scoped into the EIA.

- 8.2.5 Impacts on the settings of heritage assets may need to be considered. This is particularly relevant to those designated assets (e.g. listed buildings) which lie outside the currently defined study area. It is also proposed that these elements of assessment are scoped into the EIA and that the study area may need to be extended to include them, subject to the Zone of Theoretical Visibility and viewpoints applied to the Landscape and Visual Impacts Assessment.
- 8.2.6 There is also potential for impacts on unknown below-ground archaeological remains within the indicative scheme footprint. However, given the extent of the scheme footprint, such impacts are likely to be low as only relatively small areas of an individual asset should be affected. Further investigation during the assessment phase may be required to consider the effects of the scheme on any currently unknown below-ground archaeological remains. We, therefore, proposed that these elements of assessment are scoped into the EIA.

Operation and Maintenance

- 8.2.7 There is the potential for adverse impacts to occur upon the setting of nearby heritage assets and the historic landscape of the Hoo Peninsula as a result of the highway improvement scheme, as well as potentially increased numbers of vehicles on the highway.

8.3. Impacts to be Scoped Out

- 8.3.1 As stated in Paragraph 8.1.5, no World Heritage Sites, Registered Battlefields or Protected Wreck Sites have been identified within 5km of the Proposed Scheme. It is therefore proposed that impacts upon these designations are scoped out of the Historic Environment Chapter
- 8.3.2 In addition, the nearest Registered Parks and Gardens; The Officers' Terrace, the Historic Dockyard, Chatham; is located approximately 2.5km south-east of Phase 1. At this distance, the potential for significant impact is considered unlikely and it is proposed that Registered Parks and Gardens are scoped out of the Historic Environment Chapter.

8.4. Proposed Assessment Methodology

Study Area

- 8.4.1 The proposed study area to be adopted for the assessment of cultural heritage features extends to:
- 1km around the Principal Application Site for designated heritage assets (Scheduled Monuments, Listed Buildings, and Conservation Areas);
 - 500m around the Principal Application Site for non-designated heritage assets.
- 8.4.2 It is intended that the extent of the 1km study area will be reviewed against the Zone of Theoretical Visibility to confirm that no designated assets beyond the 1km Study Area would be adversely impacted through a change in setting.

- 8.4.3 With regards to the study area for archaeological remains, the Highways England Guidance HA 208/07 has been referenced. Based upon the HA 208/0,7 the study area when assessing impacts upon archaeological remains will be defined as the footprint of the Proposed Scheme, including all construction areas once fully defined, and a 200m buffer around these areas. This study area will also be adopted for the historic buildings and historic landscape sub-topic.

Assessment Scope

- 8.4.4 The assessment of the Historic Environment Assessment within the EIA will be undertaken with reference to the following guidance:

- Chartered Institute for Archaeologists, 2017, Standard and guidance for historic environment desk-based assessment;
- Chartered Institute for Archaeologists, 2014, Code of Conduct;
- Historic England, 2017, The Setting of Heritage Assets. Historic Environment Good Practice Advice in Planning Note 3;
- Historic England 2016 Preserving Archaeological Remains. Decision-taking for Sites under Development;
- Design Manual for Roads and Bridges (DMRB) LA 106 Cultural Heritage Assessment; and
- National Planning Policy Framework (NPPF) Paragraphs 193 to 196 within Chapter 16. Conserving and enhancing the historic environment.

- 8.4.5 The Historic Environment Assessment will include a desktop assessment of designated assets (Scheduled Monuments, Listed Buildings, and Conservation Areas) and non-designated assets (archaeological sites and finds, historic buildings, other historic landscape features or locally-designated features, or areas, of cultural heritage significance).

- 8.4.6 The desk-based assessment for the will include:

- Inspection of aerial photographs held by the English Heritage Archive;
- Inspection of additional sources held by the Kent HERs, such as reports on previous investigations, and local and regional cultural heritage literature held in their further information files;
- A walkover survey to determine the effects of the Proposed Scheme on archaeological remains, historic buildings and historic landscapes; and
- Consultation with heritage advisors to the local planning authority will be undertaken to identify the need for, nature scope and scale of archaeological evaluation may in support of the application.

- 8.4.7 Where the desk-based studies suggest that available information is inadequate for the purpose of the assessment, field surveys will be undertaken to enhance the data. Initially, this will involve detailed site visits, but other techniques such as earthwork and geophysical survey, historic building assessment and recording, and archaeological trial trenching may well be required (depending on ground conditions and timing of the operations). This will follow appropriate standards and guidance published by the Chartered Institute for Archaeologists, and other local guidance published by Medway Council archaeological officer.

Where the assessment identifies the need for detailed evaluations prior to, or during construction, a draft Written Scheme of Investigation would be submitted with the ES.

Assessment of Significance

- 8.4.8 DMRB states that the methodology for assigning the significance criteria (i.e. value or sensitivity of assets, magnitude of impact, and significance of effect) and reporting the significant effects of a scheme on the cultural heritage resource and its settings should follow the requirements as set out in DMRB Environmental Assessment and Monitoring (Highways England 2019b).
- 8.4.9 It is proposed that the criteria detailed in Table 27 below, will be used for assessing the value of identified assets within the defined study area:

Table 27: Criteria for assessing asset value in historic environment assessment

Value (sensitivity of resource)	Description of value / sensitivity
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

- 8.4.10 It is proposed that the criteria detailed in Table 28 will be used for assigning the magnitude of impact resulting from the scheme proposals:

Table 28: Criteria for assessing impact magnitude in historic environment assessment

Magnitude of impact	Description of Impact Magnitude
Major	Adverse: Loss of resource and/ or quality and integrity of resource; severe damage to key characteristics, features or elements.
	Beneficial: Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Moderate	Adverse: Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
	Beneficial: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.

Magnitude of impact	Description of Impact Magnitude
Minor	Adverse: Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial: Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse: Very minor loss or detrimental alteration to one or more characteristics, features or elements.
	Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements.
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

8.4.11 Finally, each of the reported effects will be assigned a level of significance. This will be undertaken using a matrix approach as detailed in Table 4. Professional judgement will be used when assigning significance categories, especially where the matrix includes two potential significance categories, to produce the reporting of a single significance value.

8.4.12 The criteria detailed in Table 29 will then be used to categorise the descriptions of the significance of effects:

Table 29: Criteria for assessing effect significance in historic environment assessment

Significance category	Description of Effect Significance
Very Large	Effects at this level are material in the decision-making process.
Large	Effects at this level are likely to be material in the decision-making process.
Moderate	Effects at this level can be considered to be material decision-making factors.
Slight	Effects at this level are not material in the decision-making process.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

8.4.13 Effects considered to be of moderate, large or very large significance would be deemed to be significant. Effects considered to be of neutral or slight significance would not normally be deemed to be significant, unless special circumstances applied. The approach to assigning significance of effect relies on reasoned argument, the professional judgement of those undertaking the assessment, and using effective consultation to ensure the advice and views of relevant stakeholders are considered.

8.5. Assumptions and Limitations

8.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.

- 8.5.2 A full understanding of the Proposed Scheme will be available when assessing the impacts on the identified cultural heritage resource. To ensure that any defined study area is sufficiently large enough to be able to foresee potential peripheral works, such as construction compounds, areas of vegetation enhancement, service diversions etc.

The requirement for any potential field investigation to support the assessment work (such as earthwork and geophysical survey, historic building assessment and recording, and archaeological trial trenching) will be considered from an early stage, as many field evaluation techniques are time and weather dependent, and they need to fit in with the current agricultural regime. For example, archaeological trial trenching and geophysical survey is best undertaken in late summer and autumn, between cropping, so as to minimise disruption to landowners. Conversely, earthwork surveys are best done in the winter months, when vegetation growth is low.

8.6. References

- Carpenter E., Newsome S., Small F., Hazell Z. Research Report Series no. 21-2013 Hoo Peninsula Historic Landscape Project, English Heritage 2013
- Historic England Heritage Gateway <https://www.heritagegateway.org.uk/Gateway/>
- Historic England 2017 *The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3* (2nd edition)
- Historic England 2019 *Statement of Heritage Significance: Analysing Significance in Heritage Assets: Historic England Advice Note 12*
- Highways England 2019a *Sustainability & Environment Appraisal (LA 106): Cultural Heritage Assessment*
- Highways England 2019b *Sustainability & Environment Appraisal (LA 104): Environmental Assessment and Monitoring*
- Kent County Council Heritage mapping
<https://webapps.kent.gov.uk/KCC.HeritageMaps.Web.Sites.Public.Default.aspx>
- Medway Council Heritage Assets mapping
https://www.medway.gov.uk/downloads/file/2086/heritage_assets
- Medway Council *Medway Heritage Asset Review 2017*
- MHCLG (Ministry of Housing, Communities and Local Government) 2019 *National Planning Policy Framework*

9. Landscape and Visual

9.1. Scoping Baseline

9.1.1 The following baseline section has been compiled using data gathered from the following sources:

- Medway Council (including online resources e.g. Medway Local Plan, Medway Landscape Character Assessment, Definitive Maps, Medway Council Parks and Rights of Way, Medway Council Parks and Play Areas);
- Natural England (online resource);
- MAGIC (online resource);
- Google Earth Pro (online resource); and
- Bing maps (online resource).

9.1.2 The following study area(s) have been used when identifying the baseline conditions at the site:

- A study area consisting of a 2km offset from either side of the centreline of the roads with the Proposed Scheme. This study area has been applied based upon the potential for landscape or visual effects arising from the Proposed Scheme, in accordance with the principles set out within paragraph 5.2 of the 'Guidelines for Landscape and Visual Impact Assessment, 3rd Edition: Landscape Institute and Institute of Environmental Management & Assessment (2013)'; and
- The study area would be refined during detailed site inspections to inform future Landscape and Visual Impact Assessment (LVIA) for the anticipated ES and following the development if a Zone of Theoretical Visibility (ZTV).

The Site and Surroundings

9.1.3 Surrounding Phase 1 of the Proposed Works, land uses are predominantly urban and residential to the south of the A289 Hasted Road where Wainscott is situated and more rural and agricultural to the north. There are also areas of deciduous woodland to the east. Phase 2 is less urbanised and is mostly surrounded by agricultural fields and areas of woodland except for where Chattenden is bisected by the A228. Several woods which contain Ancient Woodland can be located to the north of Phase 2. In the eastern part of the scheme, Phases 3 and 4 are predominantly surrounded by agricultural fields. Other habitats in this part of the scheme mostly include hedgerows and lines of trees surrounding the highway. Phase 3 is also situated north of Hoo St Werburgh village. Land use to the north and west of Phase 5/6 is predominantly residential in nature, with undeveloped fields to the east and south of Wulfere Way.

- 9.1.4 Adjacent to the scheme footprint there is a variety of land use including agricultural land, commercial development, military education and training camps and natural features such as woodland and watercourses.

Landscape Designations

- 9.1.5 Whilst there are no specific landscape designations within the study area which pertain to the Proposed Scheme, Conservation Areas have been noted at (i) Frindsbury Manor and Farm, immediately south-west of Phase 5/6; (ii) Upnor, approximately 750m south-east of where Phase 5/6; and (iii) St. Mary Hoo, approximately 2.5km to the north-east of Phase 4. There are also a number of conservation areas within 2.5km south of Phase 5/6 within the Rochester and Chatham areas, including Brompton Lines, Chatham Historic Dockyard, Historic Rochester, Pembroke and Star Hill to Sun Pier.

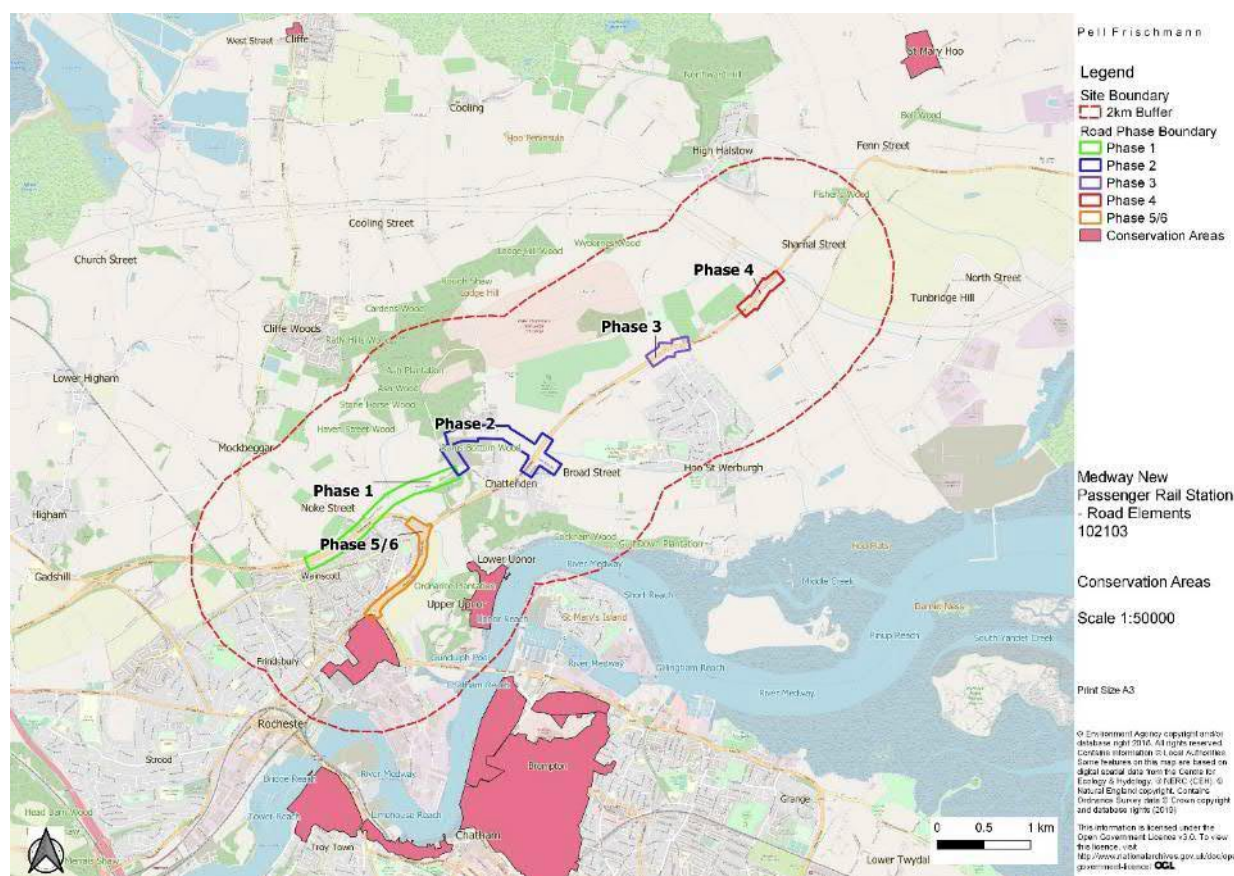


Figure 26: Conservation Area Location Map

National Character Area

- 9.1.6 The Scheme is located within National Character Area 113: North Kent Plain.
- 9.1.7 The North Kent Plain National Character Area occupies a strip of land between the Thames Estuary to the north and the chalk of the Kent Downs to the south. Lying mainly on fine loam soils, the North Kent Plain is a productive agricultural area of England. With a generally low, gently undulating landform, the landscape is characterised by large, exposed arable and horticultural fields with regular patterns and rectangular shapes. These are predominantly

devoid of hedgerows, and there is only limited shelter-belt planting around settlements, farmsteads, orchards and horticultural crops.

9.1.8 Key characteristics of the North Kent Plain are:

- An open, low and gently undulating landscape, characterised by high-quality, fertile, loamy soils dominated by agricultural land uses;
- The area's geology is dominated by Palaeogene clays and sands, underlain by the Chalk;
- Geologically a chalk outlier – and historically an island separated from the mainland by a sea channel – Thanet forms a discrete and distinct area that is characterised by its unity of land use, arising from the high-quality fertile soils developed in thin drift deposits over chalk;
- A diverse coastline (both in nature and orientation), made up of cliffs, intertidal sand and mud, salt marshes, sand dunes and shingle beaches. Much of the coastal hinterland has been built on, and the coast itself has been modified through the construction of sea walls, harbours and piers;
- Large arable/horticultural fields with regular patterns and rectangular shapes predominating, and a sparse hedgerow pattern;
- Orchards and horticultural crops characterise central and eastern areas, and are often enclosed by poplar or alder shelterbelts and scattered small woodlands;
- Woodland occurs on the higher ground around Blean and in smaller blocks to the west, much of it ancient and of high nature conservation interest;
- The Stour and its tributaries are important features of the eastern part of the NCA, draining eastwards into the North Sea, with associated wetland habitats including areas of grazing marsh, reedbeds, lagoons and gravel pits. The River Medway cuts through the NCA as it flows into the Thames Estuary;
- Other semi-natural habitats include fragments of neutral, calcareous and acid grassland, and also heathland;
- The area has rich evidence of human activity from the Palaeolithic period. Key heritage assets include Roman sites at Canterbury, Reculver and Richborough; the Historic Dockyard at Chatham; military remains along the coast; and historic parks and buildings; and
- Large settlements and urban infrastructure (including lines of pylons) are often visually dominant in the landscape, with significant development around Greater London and the Medway Towns, as well as around towns further east and along the coast. Major rail and road links connect the towns with London.

Regional Level Landscape Character Assessment

- 9.1.9 A regional level Landscape Character Assessment (LCA) has been undertaken by Medway Council in March 2011. This LCA encompasses a number of Principal Landscape Areas which are split into Landscape Character Areas. The Proposed Works fall under the Hoo Peninsula Principal Landscape Area. The Hoo Peninsula landscape area has also been assessed by Kent County Council in October 2004 in their Landscape Assessment of Kent.
- 9.1.10 The Landscape Assessment of Kent considers the Hoo Peninsula holistically. Key characteristics for the Hoo Peninsula landscape area are noted as:
- Prominent hills and low-lying alluvial marshes;
 - Flat/ undulating farmland;
 - Decline in orchards and mixed farmland with shelterbelts;
 - Intensive, open farmed arable land; and
 - Intrusive influence of industrial development.
- 9.1.11 As stated above, the 2011 Medway LCA considers the Hoo Peninsula as a Principal Landscape Area and splits the area into several Landscape Character Areas. The Hoo Peninsula Farmland landscape area covers Phase 3 and 4 of the Proposed Works and the landscape is classified as flat or undulating open/ open arable farmland.
- 9.1.12 Key characteristics of the Medway LCA Hoo Peninsula Farmland landscape area are noted as:
- Undulating predominantly arable farmland with large open fields and little sense of enclosure; extensive views from higher ground towards estuaries;
 - Weak landscape structure, lack of distinctiveness and overall coherence;
 - Field boundaries – mixed fences and hedges – sparse and poorly managed hedgerows, isolated trees and blocks of woodland (often around farm buildings);
 - Many detracting features – poor quality edges to farms and settlements with discordant conifers, roads (notably A228), railway, signs, telephone lines and pylons/ power lines; industrial areas at Grain and Kingsnorth often prominent in views to south and east; and
 - Two large remnant orchards along A228 – at Deangate and Fenn Street.
- 9.1.13 Cliffe Woods Farmland covers Phase 1 of the Proposed Works along the A289 Hasted Road, as well as land surrounding Cliffe Woods and further north around Cliffe. The landscape is typified as flat or undulating mixed farmland with the sub-type classified as orchards and mixed farmland.
- 9.1.14 Key characteristics of the Medway LCA Cliffe Woods Farmland landscape area are noted as:

- Undulating and complex mix of arable farmland and orchards – diverse, small scale and intimate;
- Poplar shelterbelts are dominant feature along lanes, roads and fields, providing strong sense of enclosure;
- Loss of orchards to arable in places has led to decline in distinctive fruit belt character;
- Tranquil, rural feel away from main roads creates a distinctive landscape with few detracting features;
- Principal development impacts and detracting features are main road (B2000) with heavy traffic includes lorries servicing aggregate works and industrial estate, pylons to north, suburbanisation of village edges, farms plus increasing trend towards visually intrusive horticultural polytunnel frames; and
- A289 forms southern boundary of character area; to south west road bisects area of countryside separating Strood urban area from rural settlement at Higham; green buffer protects separate identity of Higham; green belt and rural lanes designations; views of countryside from road restricted by embankment and planting.

9.1.15 Chattenden Ridge landscape area crosses parts of Phase 2 of the Proposed Works near to Round Top Wood. The area also includes several other woods in the vicinity. The landscape type is classified as isolated wooded or farmed hills, with a sub-type of wooded hills and ridge.

9.1.16 Key characteristics of the Medway LCA Chattenden Ridge landscape area are noted as:

- Prominent steep wooded ridge with open farmed area at eastern end, dropping down to broad valley bottom at Lodge Hill Training Camp; golf course at southern edge defined by block of woodland;
- RSME (Royal School of Military Engineering) camp with extensive network of buildings, earthworks, roads and areas of natural regeneration; includes ammunition depot to south west; includes some detracting features but retains distinctive character and contains many remote and tranquil areas;
- Extensive woodland blocks particularly to west with high levels of protective designation, including SSSI and Ancient Woodland;
- Visibility/ views – dramatic views to north of Thames Estuary (particularly high points along Rough Shaw and along north side of Berry Court Wood), also views south towards North Downs and east towards Kingsnorth; open views towards and back from High Halstow; ridge forms strong landscape feature in views from north; and
- Water features run east west through camp and lend distinctive character to site – contains network of streams and areas of standing water; streams flow south into Hogmarsh Valley and east towards Kingsnorth; includes man-made deep-water diving pool (operational facility of Defence Estates training area).

9.1.17 Deangate Ridge landscape area covers parts of Phase 2 and 3 of the Proposed Works and is bisected by the A228 Peninsula Way. The area also includes land either side of the highway between Deangate Wood (to the north) and Hoo St Werburgh (to the south). The landscape type is classified as isolated wooded or farmed hills with a sub-type of open farmed hills and ridges.

9.1.18 Key characteristics of the Medway LCA Deangate Ridge landscape area are noted as:

- Elevated ridge, medium scale farmland with undulating arable fields;
- Provides green buffer that separates and screens RSME Lodge Hill Camp from Hoo St Werburgh;
- Distinctive tract of open countryside that provides attractive setting for A228 which bisects area; built development around fringes of Hoo and Chattenden settlements prominent in many views;
- A228 as major transport artery through central Hoo Peninsula is detracting landscape feature;
- Medium scale fields divided by hedgerows, introduce local distinctiveness and provide human scale to landscape;
- Includes well used set of recreation facilities including golf course and outdoor sports; associated buildings;
- Golf course area retains openness but with more manicured appearance compared with arable farmland; scale reduced by tree clumps; blends reasonably – natural landform reduces prominence in open views; and
- Stream to south west corner links Chattenden and Hoo.

9.1.19 Hoo Farmland landscape area covers eastern parts of Phase 2 of the Proposed Works where the area is crossed by the A228 Peninsula Way between Chattenden Barracks to the west and land south of Hoo St Werburgh to the east. The landscape type is classified as rural fringe with a sub-type of rural fringe with industrial/urban influences.

9.1.20 Key characteristics of the Medway LCA Hoo Farmland landscape area are noted as:

- Undulating arable farmland with large open fields; fragmented hedgerow network and sparse tree cover;
- Fragmented landscape – infrastructure (A228 and Ratcliffe Highway) prominent in views with ribbon development at Broad Street detracting from rural character and coherence;
- Long open views from elevated ground which include the Kingsnorth and Grain Industrial areas;

- Stream hidden feature; flows from Chattenden to Hoo St Werburgh along route of old tramway; and
- Saxon Shore Way defines southern edge of character area and provides strong east/ west footpath connection.

9.1.21 Hogmarsh Valley landscape area crosses the A228 Four Elms Hill between Four Elms Roundabout where the A289 Hasted Road, B2108 Hoo Road and A289 Wulfere Way meet, and where Upchat Road crosses the A228 in a road bridge. It also covers land to the north of the Four Elms Roundabout and south of the road surrounding Tower Hill. The landscape type is classified as urban fringe with a sub-type of urban fringe with urban/ industrial influences.

9.1.22 Key characteristics of the Medway LCA Hogmarsh Valley landscape area are noted as:

- Broad valley with open, gently rolling arable farmland and distinctive elevated woodland backdrops – at Tower Hill, Beacon Hill and Chattenden Ridge; landscape forms a green buffer, a distinctive gateway and green backdrop to Medway Towns;
- Hogmarsh stream runs along valley floor and includes small pockets of marshland; area predominantly situated within tidal flood zone and has flood alleviation/ storage potential; Whitewall Creek remains a distinctive natural feature, but distinctiveness eroded by surrounding urban infrastructure;
- Provides a distinctive and attractive setting for Manor Farm and Upnor Conservation areas;
- Detracting features include: Transport corridor (A289); eastern edges of urban settlement at Wainscott; sewage treatment works and military infrastructure (RSME sites at Wainscott and Tower Hill – Gundolph pool);
- Distinctive views across river towards Chatham Historic Dockyard and covered slips; development at Medway City Estate is a detracting feature in many views from lower ground;
- Retains rural character but coherence and overall integrity disrupted by urban fringe and military infrastructure land uses; unsympathetic boundary treatment features and neglected pockets of land; and
- Pockets of tranquillity at Islingham Farm; Manor Farm and Frindsbury Barn (Grade I listed) and around fringes of Upper Upnor.

9.1.23 Bald Top Hill is located to the north of the A228 and encompasses part of Woodfield Way, where Phase 1 and 2 of the Proposed Works meet. It is located on Bald Top Hill and borders areas of woods, such as Round Top Wood to the north. The landscape type is classified as isolated wooded or farmed hills with a sub-type of open farmed hills and ridges.

9.1.24 Key characteristics of the Medway LCA Bald Top Hill landscape area are noted as:

- Prominent farmed hill; distinctive open pastoral landscape; strong feature in views from A289 and Wainscott;

- Very tranquil, unspoilt and well-tended space with strongly rural character to north and west slopes; retains remoteness but with some urban influence to south and east;
- Views – settlement and roads to south; long distance views to North Downs; Chattenden Ridge and Round Top Hill to north; long distance views to Essex marshes and Tilbury Power Station;
- Some remnant hedgerows and groups of trees on slopes but crown of hill very open and exposed (links to name); blocks of scrub to lower slopes along Woodfield Way; and
- Stream to lower west and eastern slopes links into Hogmarsh Valley stream; informally lined with trees to west provides distinctive character to lower slopes.

Summary of Sensitive Receptors

9.1.25 From the baseline information presented above, the following sensitive receptors have been identified within the study area and where views could be impacted by the Proposed Scheme:

- Residential properties located
 - to the south of A289 Hasted Road and Phase 1 (and to the north and west of Phase 5/6) in Wainscott;
 - to the north of Phase 1 and west of Higham Road;
 - to the north of Phase 2 along Lodge Hill Lane and Elmwood Road;
 - to the south of the A228 Peninsula Way and Main Road Hoo Roundabout in Chattenden;
 - Four Elms Place residential housing development project to the west of the A228 Peninsula Way and Main Road Hoo Roundabout;
 - properties immediately south of Ratcliffe Highway in Phase 3; and
 - an isolated residential property within Phase 4 to the north of Roper's Lane;
- Public Rights of Way including National Cycle Routes 1 and 179, Medway footpaths RS46 (Peninsula), RS102 (Peninsula), RS107 (Peninsula), RS118 (Strood Rural), RS119 (Strood Rural), RS125 (Strood Rural), RS129 (Strood Rural), and Medway Bridleways RS110 (Peninsula) and RS112 (Peninsula).
- Public Open Space/ recreational areas including Peninsula Bowls Club within the southern boundary of Phase 3 of the Proposed Works, sports fields/ facilities to the east and west of the Peninsula Bowls Club either side of Bell's Lane, potentially some of the woods near Chattenden and Phase 2 of the Proposed Works which could be used for walking and recreation, a play space and a recreational grassed area within Liberty Park west of Four Elms Roundabout, and also land associated with Public Rights of Way such as non-agricultural fields near all of the phases;

- Places of education/ related to military operations including Wainscott Camp, Construction Engineering School and associated buildings immediately north of Islingham Farm Road within Phase 1 of the Proposed Works. Wainscott Primary School is located to the north of Wulfere Way and Phase 5/6;
- Commercial properties including land to the north of Woodfield Way within Phase 1 of the Proposed Works which appears to be used for commercial purposes and Homeleigh Garden Centre and Flanders Farm (AC Goatham & Son) are both situated between Phase 3 and 4 and within close proximity to the existing highway;
- Landscape designations, including the conservation areas of (i) Frindsbury Manor and Farm; (ii) Upnor; and (iii) St. Mary Hoo.
- Highway and transport infrastructure including the A289 Hasted Road, Guinness Drive, Leigh Road, Cagney Close, Grant Road, Higham Road, Islingham Farm Road, Haven Street, Woodfield Way (and associated roundabout), Lochat Road, Upchat Road, Chilliwack Road, Kitchener Road, land where the Proposed Relief Road will be built within Phase 2 of the Proposed Works, Chattenden Lane, Swinton Avenue, Kirby Road, A228 Peninsula Way, Main Road Hoo, Ratcliffe Highway, Haigh Villas, Main Road Chattenden, Bell's Lane, Dux Court Road, A228 Ratcliffe Highway, Roper's Lane, A289 Wulfere Way, Four Elms Roundabout, Sans Pareil Roundabout and some other roundabouts located along the A228.

9.2. Potential Impacts of the Proposed Scheme

Construction Phase

9.2.1 Examining the Proposed Scheme, described in Chapter 2, together with the initial consideration of sensitive receptors identified within the Baseline Section of this chapter, we consider that the Proposed Scheme has the potential to result in the following impacts during the construction phase. We propose that these elements of assessment are scoped into the EIA:

- Direct and permanent impacts upon the landscape resource including removal of existing trees and hedgerows and loss of agricultural land;
- Permanent effects upon landscape character resulting from a loss of key characteristics;
- Temporary effects upon visual receptors including residential properties, Public Rights of Way, Public Open Space, recreational areas, commercial properties and highways; and
- Temporary effects upon landscape character resulting from impact upon setting and perceptual quality as a result of construction activity.

Operation and Maintenance

9.2.2 We consider that the Proposed Scheme has the potential to result in the following impacts during the Operation and Maintenance. We propose that these elements of assessment are scoped into the EIA:

- Impacts upon visual receptors; and
- Impacts upon landscape character, in particular perceptual qualities.

9.3. Impacts to be Scoped Out

9.3.1 It is not proposed that any elements of landscape or visual assessment be scoped out of the LVIA.

9.4. Proposed Assessment Methodology

9.4.1 The Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3) set out a detailed and appropriate methodology for undertaking an assessment of potential landscape and visual effects. GLVIA3 states (at para 1.1) that, “*LVIA is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people’s views and amenity.*” At para 2.21 GLVIA3 further states that, “*the two components of LVIA are:*

- *assessment of landscape effects:* assessing effects on the landscape as a resource in its own right;
- *assessment of visual effects:* assessing effects on specific views and on the general amenity experienced by people.”

9.4.2 The two elements are inter-linked and both must be addressed by LVIA.

9.4.3 The Zone of theoretical Visibility (ZTV) for the scheme will be identified and refined through a combination of 3-D modelling and on-site surveying within a 3km radius of the Proposed Scheme, beyond which the potential for significant effects are not anticipated to arise, due to the scale of Proposed scheme and distance from the potential receptors.

9.4.4 Note that the assessment of potential effects upon Historic Landscapes would be undertaken by the relevant Historic Environment specialist and presented in the heritage chapter of the ES.

Construction Phase

9.4.5 Both a quantitative i.e. areas of landscape resource/features, and a qualitative assessment of construction phase effects upon the landscape resource, including landscape character, in accordance with GLVIA3 will be undertaken, taking account of embedded mitigation measures.

- 9.4.6 A qualitative assessment of the potential visual effects upon identified receptors will also be undertaken in accordance with GLVIA3.
- 9.4.7 The potential for any residual effects arising from construction will also be considered.

Operation and Maintenance

- 9.4.8 Again, both a quantitative i.e. areas of landscape resource/features and a qualitative assessment upon landscape character in accordance with GLVIA3 will be undertaken.
- 9.4.9 A qualitative assessment of the potential visual effects of the operational phase of the Proposed Scheme upon identified receptors will also be undertaken in accordance with GLVIA3, taking account of embedded mitigation measures.
- 9.4.10 Additionally, an assessment of residual landscape and visual effects, 15 years post completion at a point where any planting scheme may have a substantive effect, will be undertaken.

Assessment of Significance

- 9.4.11 The assessment of likely significant effects, to both the landscape resource and visual baseline, requires consideration of the sensitivity of the resource/receptor to change and the magnitude of change that may result from the Proposed Scheme. This assessment will be systematic and include the range of effects that will arise from the Proposed Scheme i.e. during construction and operation. The significance of effects will be judged as positive (beneficial), neutral or negative (adverse). Where no change is anticipated, to either the landscape resource or a potential visual effect, then a Neutral significance of effect would be assigned.
- 9.4.12 The temporal scope of effects will be considered, namely the effects likely in the short, medium or long term and be assessed as either temporary (reversible) or permanent.

Landscape Resource

- 9.4.13 GLVIA3 recommends that the *Sensitivity of Receptors* should include judgements in respect of the susceptibility of the receptor to the type of change, both physical and perceptual, arising from the development and the value attached to that receptor. The vulnerability of key features within the landscape resource to change, particularly those characteristics which contribute to landscape character, forms a key criterion for this judgement. This methodology employs a four point scale to categorise the susceptibility of landscape receptors to change thus ensuring that judgements around 'sensitivity' are based upon criteria that are recognisable, can be applied equally across a range landscape resources and are accessible i.e. that the assessment and evaluation process is demonstrably systematic.
- 9.4.14 GLVIA3 recognises that a judgement is required hence not all criteria are required, or in specific combination, to determine the Sensitivity and supports a verbal scale (Very High, High, Medium and Low). A simplistic 'scoring' process is not appropriate and judgements will be supported by descriptive, explanatory text. The four-point scale for evaluation of the landscape resource sensitivity is detailed in Table 30 below.

Table 30: Criteria for assessing asset value in respect of the Landscape Resource

Value	Description of value / sensitivity
Very High	Where the landscape character of very high value (i.e. a nationally designated landscape) and/or very susceptible landscape characteristics, features or perceptual qualities e.g. features that make a strong/positive contribution to landscape character and would take a considerable time to replace.
High	Landscape character of high value (i.e. a regionally designated landscape) and/or susceptible landscape characteristics, features or perceptual qualities e.g. with many features that make a strong/positive contribution to landscape character and would take a considerable time to replace.
Medium	Landscape character of moderate value (i.e. undesignated landscape of local value) and/or moderately susceptible landscape characteristics, features or perceptual qualities e.g. with features that contribute to landscape character but would be replaceable in the medium term.
Low	Landscape character of low value and landscape characteristics, features or perceptual qualities of limited susceptibility e.g. with features that would be easily replaceable in the short term.

- 9.4.15 The magnitude of effect consists of an evaluation in terms of the size and scale of change to landscape resources arising from the Proposed Scheme, the geographical extent over which such changes will be experienced and the duration of effect. The scale of change to landscape resources receptor is assessed with respect to the loss or addition of new features and the extent/proportion to which landscape features will be lost and contribution those features make to landscape character; in particular, if the changes affect key characteristics that are critical to the distinctive character. The perceived changes to the perceptual qualities as a result of changes, removal of existing features or addition of new ones, will also be considered. The geographical extent, as distinct from the size/scale of the Proposed Scheme, will be considered and judgements undertaken that include changes which affect the site only, the immediate setting of the site, at a scale of the landscape character area/type or at a larger scale e.g. several landscape character areas/types.
- 9.4.16 The duration of effect considers the period over which the changes to the landscape resource arising from the Proposed Scheme will occur; these may be short, medium or long term. As appropriate these durations will be defined in the LVIA chapter; typically, short term will be zero to five years, medium term 5 to 10 years and long term 10 to 25 years. Some development types are considered to be reversible e.g. mineral extraction where the landscape may be reinstated/restored upon completion of the workings, although the duration of this change may be long term and could effectively constitute a permanent feature for a generation. The assumptions made in terms of both duration and reversibility will be stated in the LVIA chapter.
- 9.4.17 The evaluation of magnitude of effect is described, within this methodology, on a four-point scale; ranging from High to Negligible. The assessed change to the landscape resource, taking account of the above judgements, is then presented in the LVIA report with supporting/explanatory text in the report. The four-point scale is detailed in Table 31 below.

Table 31: Criteria for assessing impact magnitude in respect of the Landscape Resource

Value	Description of Impact Magnitude
High	A total loss of, or large-scale alteration to, key elements/features/ characteristics of the landscape resource (the landscape or perceptions of the landscape) and/or the introduction of prominent elements arising from the proposed development considered to be totally uncharacteristic compared to the distinctive attributes of the receiving landscape.
Medium	Partial loss of or moderate scale (clearly perceptible) alteration to one or more key elements/ features/characteristics of the landscape resource and/or introduction of elements as a result of the proposed development that may be prominent but may not necessarily be considered as uncharacteristic compared to the distinctive attributes of the existing view/visual amenity.
Low	Minor loss of or small-scale alteration to one or more key elements/ features/characteristics of the landscape resource and/or introduction of elements as a result of the proposed development that may be considered characteristic of the receiving landscape.
Negligible	Very minor loss or very small-scale alteration to one or more key elements/ features/characteristics of the existing landscape resource and/or introduction of elements as a result of the proposed development that are considered to be characteristic of the receiving landscape.

9.4.18 The significance of effect upon the landscape resource constitutes the interaction of Sensitivity of receptor and magnitude of effect. The significance of effect is not absolute and can only be defined relative to the Proposed Scheme subject to LVIA i.e. the Application Site and development proposed with reliance upon professional judgement. A higher level of significance is associated with a higher magnitude of effect upon more sensitive i.e. nature of receptor, landscape receptors.

9.4.19 The supporting descriptions that will be used for the indicative significance of effects upon the landscape resource are detailed in Table 32 below.

Table 32: Criteria for assessing effect significance in respect of the Landscape Resource

Value	Description of Effect Significance
Very Major	The introduction, as a result of the proposed development, of features that are discordant and/or intrusive and will result in a loss or substantial deterioration of the distinctive landscape characteristics, features or perceptual qualities to very high sensitivity landscape receptors.
Major	The introduction, as a result of the proposed development, of features that are considered to be discordant and/or intrusive leading to a loss or substantial deterioration of the distinctive landscape characteristics, features or perceptual qualities.
Moderate	The introduction, as a result of the proposed development, of features considered to be discordant and/or intrusive leading to a discernible or partial deterioration to the distinctive characteristics, features or perceptual qualities.
Minor	The introduction, as a result of the proposed development, of features that will lead to a slight deterioration to landscape characteristics, features or perceptual qualities.

Value	Description of Effect Significance
Negligible	The introduction, as a result of the proposed development, of features that will lead to an imperceptible change to landscape characteristics, features or perceptual qualities.

Visual Effects

- 9.4.20 Baseline studies identify both the location of visual receptors and nature of potential visual effects. The Sensitivity of Receptor includes judgements in respect of the susceptibility to change for differing visual receptors together with visual amenity. Visual receptors most susceptible to change include residents at home including communities where views contribute to landscape setting, outdoor recreation users e.g. public rights of way whose interest is focussed upon the landscape/particular views, visitors to cultural heritage assets or other attractions that are landscape based. Receptors less susceptible to change include travellers on road, rail and other transport route users. Least sensitive visual receptors include people at work (commercial properties) and where views are not important to the quality of working life, people engaged in outdoor sport/recreation which does not involve or is dependent upon views of the landscape.
- 9.4.21 Similar to the four point scale employed to categorise the nature of landscape receptors this methodology identifies visual receptors, based upon the susceptibility to change identified within GLVIA3 on a similar basis; see Table 33 below. GLVIA3 recognises that the categorisation of receptors can be fluid and may be tailored as appropriate for a particular LVIA. The value attached to a particular view e.g. through designation or cultural reference, also contributes to the sensitivity of receptor.
- 9.4.22 For the purposes of this methodology visual amenity is interpreted as the overall enjoyment of a view as experienced by a visual receptor. This is considered to be a perceptual quality and will be noted within the supporting text where visual amenity constitutes a significant element of the visual assessment.

Table 33: Criteria for assessing asset value in respect of Visual Effects

Value	Description of value / sensitivity
Very High	Visual receptor locations where people are engaged in an occupation or activity where their attention or interest may be focused primarily upon views or visual amenity e.g. residents, walkers, visitors to heritage assets, etc. Includes designated viewpoints and views with an emphasis upon the landscape e.g. National Parks.
High	Locations where people are engaged in an occupation or activity where their attention or interest may be focused upon views and visual amenity (i.e. communities where the visual setting is a key characteristic), those engaged in outdoor recreation e.g. cyclists, field sportsmen, golfers, etc and tourist e.g. Scenic Routes, as well as resident road users.
Medium	Locations where people are engaged in an occupation or activity where their attention or interest may be focused on views and visual amenity e.g. general road users, rail users, commuter routes and those engaged in outdoor work (i.e. farmers).
Low	Locations where people are engaged in an occupation or activity with limited or minimal focus upon views and visual amenity e.g. retail and industrial workers.

Value	Description of value / sensitivity
	Views of the landscape do not contribute to the quality of working life. Outdoor sport and recreation facilities, both users and spectators, where views or the landscape are not a key characteristic.

9.4.23 The magnitude of effect consists of an evaluation in terms of the size and scale of visual effect arising from the Proposed Scheme, the geographical extent (or Zone of Visual Influence) and the duration of effect. The scale of change to the view from a particular visual receptor is assessed with respect to the loss or addition of features and changes to the composition of the view (including the proportion of view occupied by the Proposed Scheme). The contribution of existing elements or features within a view e.g. the screening effect of adjacent buildings or woodland, is also considered. These changes are likely to include judgements in respect of the contrast or integration of new features and characteristics of development including scale, mass, height and colour.

9.4.24 The nature of the view will also account for the duration of view e.g. will the Proposed Scheme be viewed in full or glimpsed. GLVIA3 does not specifically require a visual assessment to be undertaken over two seasons e.g. in winter to assess a 'worst case' scenario and in summer to highlight the screening effect of vegetation. Nevertheless, it is intended that an assessment over two seasons will be undertaken to inform the subsequent LVIA chapter.

Duration of effect considers the period over which the Proposed Scheme will affect a particular receptor and may be short, medium or long term. As appropriate these durations will be defined in the LVIA report; typically, short term will be zero to five years, medium term 5 to ten years and long term ten to twenty-five years. A number of development types are considered to be reversible e.g. windfarms, although the duration of this change may be long term and could effectively constitute a permanent feature for a generation.

9.4.25 The evaluation of Magnitude of Effect is described, within this methodology, on a four point scale; ranging from High to Negligible. The assessed change in view, or visual amenity, from a particular visual receptor taking account of the above judgements, is then recorded in tabular format and presented in the LVIA report, typically as an appendix, with supporting/explanatory text in the report. The four point scale is detailed in Table 34.

Table 34: Criteria for assessing impact magnitude in respect of Visual Effects

Value	Description of Impact Magnitude
High	A total loss of, or large-scale alteration to, key elements/features/characteristics of the view/visual amenity and/or the introduction of visually prominent elements arising from the proposed development in close proximity to the receptor and considered to be uncharacteristic compared to the distinctive attributes of the existing view/visual amenity.
Medium	Partial loss or moderate scale (clearly perceptible) alteration to one or more key elements/ features/characteristics of the view/visual amenity and/or introduction of elements as a result of the proposed development that may be visually prominent (relatively close and/or oblique angle of view) but may not necessarily be considered to be uncharacteristic compared to the distinctive attributes of the existing view/visual amenity.

Value	Description of Impact Magnitude
Low	Minor loss of or small-scale alteration to one or more key elements/features/characteristics of the view/visual amenity and/or introduction of elements as a result of the proposed development that may be considered characteristic of the existing view/visual amenity.
Negligible	Very minor loss or barely perceptible alteration to one or more key elements/features/characteristics of the existing view/visual amenity and/or introduction of elements as a result of the proposed development that are considered to be characteristic of the view. Where existing features in the landscape, buildings and/or vegetation, intervene and offer a predominantly effective screen.

9.4.26 The significance of visual effect also constitutes the interaction of sensitivity of receptor and magnitude of effect. Again, the significance of effect is not absolute and can only be defined relative to the Proposed Scheme. A higher level of significance is associated with a higher magnitude of effect upon more sensitive visual receptors.

9.4.27 The indicative criteria for significance of effect upon visual receptors/visual amenity are detailed in Table 35 below and are also considered to accord with GLVIA3. As described at the Assessment of Landscape Effects above, the LVIA chapter will provide supporting text to final significance of effect.

Table 35: Criteria for assessing effect significance in respect of Visual Effects

Value	Description of Effect Significance
Very Major	The introduction, as a result of the proposed development, of features that are visually discordant and/or intrusive and will significantly affect the views/visual amenity of very high sensitivity visual receptors leading to a loss and/or substantial deterioration to the distinctive visual characteristics or perceptual qualities.
Major	The introduction, as a result of the proposed development, of features that are considered to be visually discordant and/or intrusive and will substantially affect the views/visual amenity of visual receptors leading to a loss or substantial deterioration to the distinctive visual characteristics or perceptual qualities.
Moderate	The introduction, as a result of the proposed development, of features considered to be visually discordant and/or intrusive to views/visual amenity of visual receptors that will lead to a discernible or partial deterioration to the distinctive visual characteristics or perceptual qualities.
Minor	The introduction, as a result of the proposed development, of features that will lead to a slight deterioration to the visual characteristics or perceptual qualities.
Negligible	The introduction, as a result of the proposed development, of features that will lead to an imperceptible change to views/visual amenity or perceptual qualities.

9.5. Assumptions and Limitations

9.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.

9.5.2 The required construction footprint for the Proposed Scheme is yet to be determined.

9.6. References

- Highways England 2020 Sustainability & Environment Appraisal (LA 113): Road Drainage and the Water Environment (Revision 1 March 2020) (formerly HD 45/09)
- Kent County Council The Landscape Assessment of Kent (October 2004)
- Landscape Institute 2013 Guidelines for Landscape and Visual Impact Assessment: 3rd Edition (GLVIA3) - Landscape Institute and Institute of Environmental Management & Assessment
- Landscape Institute 2016 Landscape Character Assessment: Landscape Institute Technical Information Note 08/2015 (February 2016)
- Landscape Institute 2019 Visual Representation of Development Proposals; Landscape Institute Technical Guidance Note 06/19 (September 2019)
- Medway Council Medway Landscape Character Assessment (March 2011)
- Natural England 2014 An Approach to Landscape Character Assessment: Natural England (October 2014)
- Natural England 2014 National Character Area Profile 113; North Kent Plain: Natural England: (2014)

10. Road Drainage and the Water Environment

10.1. Scoping Baseline

Hydrology

- 10.1.1 Surface watercourses are present within 1km of the Proposed Scheme. According to the Environment Agency Catchment Data Explorer, none of the watercourses within close proximity to the site within the Medway Lower Operational Catchment have been given an ecological or chemical status under the Water Framework Directive (WFD). Therefore, there are no corresponding WFD objectives for these watercourses.
- 10.1.2 There is one Statutory Main River located near to the Proposed Scheme. The River Medway and the Medway Estuary is located approximately 670m to the south of Phase 2. The Medway flows west to east until it discharges into the North Sea, approximately 12km to the east of the Proposed Scheme.
- 10.1.3 An unnamed drain cuts across the centre part of Phase 1 and appears to be culverted beneath Woodfield Way. LiDAR data suggests that the drain rises from north of the Proposed Scheme near Chattenden Wood and flows southwards, to the east of Four Elms Roundabout (within Phase 5/6 and is culverted beneath the A228 Four Elms Hill) and discharges into the River Medway via Whitewall Creek. On the northern side of Woodfield Way is a small pond which the drain appears to enter into before flowing south under Woodfield Way.
- 10.1.4 An unnamed drain also runs within 50m to the east of Phase 4. A consultation of LiDAR data suggests that the drain rises from North of Phase 4 and then flows east before flowing south towards the River Medway. This drain is culverted beneath the A228 Peninsula Way to the west of Sharnal Street.
- 10.1.5 Online mapping also suggests that there are several small unnamed drains which cross near to or run parallel with parts of the Proposed Works. These generally seem to flow southwards towards the River Medway and where the ground level naturally starts to decrease.
- 10.1.6 As well as the pond near Woodfield Way, online mapping suggests that there are two pond locations immediately south of A228 Peninsula Way near to the Main Road Hoo Roundabout and Ropers Lane Roundabout. These are likely associated with the highway infrastructure, for instance as retention ponds, as online mapping suggests that they are not permanently filled with water.
- 10.1.7 A Desk Study and Preliminary Risk Assessment was undertaken by Geosphere Environmental in March 2020, (report ref: 4496,DS/DESK/AT,TP/17-03-20/V1). This covered Phases 1 – 4 of the Proposed Scheme. Data presented within this report suggests that there are no sites of potentially infilled land containing water nearby.

Hydrogeology

- 10.1.8 The Envirocheck report, BGS and Defra MAGIC mapping services have been consulted to establish aquifer designations for the Site.

Groundwater Bodies

- 10.1.9 According to the EA Catchment Data Explorer, no groundwater bodies exist under Phase 2, 3 and 4. However, the North Kent Medway Chalk groundwater body is located under parts of Wainscott and A289 Hasted Road (including Phase 1). This groundwater body is also located to the south of Wainscott and comes close to southern parts of Wulfere Way (where Phase 5/6 is located). The groundwater body has an overall WFD classification of Poor status for 2019.

Superficial Deposits

- 10.1.10 Phase 1 is partly underlain by superficial deposits, which include Alluvium (Clay, Silt, Sand and Peat), River Terrace Deposits (2 – Sand and Gravel) and Head (Clay, Silt, Sand and Gravel). Some of Phase 1 is underlain by Secondary A or Secondary (undifferentiated) Aquifers.
- 10.1.11 Phase 2 is underlain by Head (Clay, Silt, Sand and Gravel) where the proposed Relief Road reaches the Main Road Hoo Roundabout junction. It is underlain by an Unproductive Aquifer.
- 10.1.12 Phase 3 is underlain by Head (Clay, Silt, Sand and Gravel) and a Secondary (undifferentiated) Aquifer.
- 10.1.13 Phase 4 is underlain by Alluvium (Clay, Silt, Sand and Peat) towards the east and Head (Clay, Silt, Sand and Gravel) towards the west. It is underlain by a Secondary (undifferentiated) Aquifer.
- 10.1.14 Phase 5/6 is underlain by Alluvium (Clay, Silt, Sand and Peat) in northern and eastern parts of Four Elms Roundabout (likely relating to the presence of a watercourse there), Head (Clay and Silt) across central and eastern parts of A289 Wulfere Way and River Terrace Deposits 2 (Sand and Gravel) around Sans Pareil Roundabout. It is partially underlain by a Secondary A aquifer at Sans Pareil Roundabout, Secondary (undifferentiated) across parts of Four Elms Roundabout and unproductive along the majority of the A289 Wulfere Way.
- 10.1.15 The Envirocheck Report states that the Head deposits are indicated to be medium vulnerability Secondary Aquifers. The Environment Agency defines areas of medium groundwater vulnerability as “areas that offer some groundwater protection. They are likely to be characterised by intermediate leaching soils and / or the presence of intermediate permeability superficial deposits”.

Bedrock

- 10.1.16 The western part of the Phase 1 boundary is underlain by Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated) – Chalk bedrock. Further east, it is underlain by Thanet Formation (Sand, Silt and Clay), Lambeth Group (Sand, Silt and Clay) and London Clay Formation (Clay and Silt). The very west of this phase is

underlain by a Principal Aquifer, although the eastern parts of the phase are underlain by a Secondary A Aquifer.

- 10.1.17 Phases 2, 3 and 4 are underlain by London Clay Formation (Clay and Silt) and an Unproductive Aquifer.
- 10.1.18 Phase 5/6 is underlain by Thanet Formation (Sand, Silt and Clay) surrounding Four Elms Roundabout and Sans Pareil Roundabout, and Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated) – Chalk across central parts of the A289 Wulfere Way. It is underlain by a Secondary A bedrock Aquifer across most of the phase, although a small part of Wulfere Way is underlain by a Principal Aquifer.
- 10.1.19 The Envirocheck Report states that the Principal Aquifer associated with the Chalk is indicated to have a high groundwater vulnerability, as well as the Secondary aquifers associated with the Thanet Formation, Lambeth Group and River Terrace deposits. The Environment Agency defines areas of high groundwater vulnerability as “areas able to easily transmit pollution to groundwater. They are characterised by high leaching soils and the absence of low permeability superficial deposits”.

Groundwater Source Protection and Abstractions

- 10.1.20 Phase 1 and Phase 5/6 overlap with Groundwater Source Protection Zone 3, and western parts of the Phase 1 and Phase 5/6 boundaries are within 2km of SPZ 1 and SPZ2. Phase 2 is within 2km of SPZ 3. Phases 3 and 4 are not covered by any Groundwater SPZ. SPZs refer to areas where the Environment Agency provides a greater level of protection to groundwater sources, usually in areas where a public drinking water supply is sourced from the groundwater. SPZ1 is afforded the highest level of protection as it has a 50-day travel time from pollutant to source. As Phase 1 overlaps with SPZ3, it still is afforded a greater level of protection compared to the other work phases in terms of groundwater.

Flood Risk

- 10.1.21 The whole of the Application Site is not at risk from flooding. Two parts of the Application Site are located within Flood Zone 2 and 3. These areas include surrounding the unnamed drain crossing Woodfield Way within Phase 1 and northern and eastern parts of Four Elms Roundabout within Phase 5/6, and the unnamed drain east of Phase 4. These areas of flood risk are predominantly associated with the River Medway as the unnamed drains would become a flow path during a flood event. Land to the south of the Application Site is also located within Flood Zone 2 and 3 in direct relation to the River Medway.
- 10.1.22 Flood Zone 3 is classified as land with a 1 in 100 annual probability or greater of flooding from fluvial sources, or 1 in 200 annual probability or greater of flooding from tidal sources. Flood Zone 2 is classified as land having between a 1 in 100 and 1 in 1000 annual probability of flooding from fluvial sources, or between a 1 in 200 and 1 in 1000 annual probability of flooding from tidal sources.
- 10.1.23 Regarding risk of flooding from surface water, there are several areas across the Application Site where flooding would be focused. Within Phase 1, areas at high risk of flooding from surface

water (a 1 in 30/ 3.3% AEP) include surrounding the unnamed drain crossing Woodfield Way and along parts of the A289 Hasted Road. Surface water flood risk is concentrated mostly north of the A289 Hasted Road, where Islingham Farm Road meets Woodfield Way. For Phase 2, high risk areas are concentrated predominantly to the north of the Main Road Hoo Roundabout along the A228 Peninsula Way. Parts of Chattenden Lane are also at high risk. Phase 3 is at low risk of surface water flooding. . Phase 4 is also mostly not at risk, except for the eastern edge where a high risk of flooding occurs just south of the railway line, which is likely due to local topographic depressions. Phase 5/6 is also affected, with land immediately surrounding the Hasted Road to the north of Four Elms Roundabout at high risk. The roundabout itself, and parts of the A228 Four Elms Hill are at low risk of surface water flooding. The A289 Wulfere Way is mostly at low risk of flooding, except for a high and medium risk area concentrated around parts of the road to the south-east of Wainscott Primary School. This concentrated area matches a localised topographic depression, according to LiDAR data.

- 10.1.24 A consultation of Environment Agency mapping suggests that the Proposed Scheme is not within an area at risk of flooding from reservoirs. The nearest area affected by reservoir flooding is the River Medway, which is situated approximately 670m south of the Proposed Scheme.

Nature Conservation Designations

- 10.1.25 The Proposed Scheme is located within 2km of the Medway Estuary and Marshes Ramsar Site, SPA and SSSI. This area contains drains and watercourses which enter into the Medway Estuary.
- 10.1.26 The Proposed Scheme is also within 2km of the Medway Estuary MCZ, which contains the River Medway.

10.2. Potential Impacts of the Proposed Scheme

Surface Water

- 10.2.1 The Proposed Scheme has the potential to result in adverse impact upon surface water resources. It is proposed that the following elements of assessment are scoped into the EIA:
- Pollution during construction due to increased generation and release of sediments and suspended solids, and increased risk of accidental spillage of pollutants such as oil, fuel and concrete associated with construction activities and site storage requirements;
 - Loss or change to surface water supplies due to degradation of water quality, changes in drainage patterns or disruption to supply infrastructure due to the route options;
 - Impacts upon the Medway Estuary and Marshes Ramsar Site, SSSI and SPA (via unnamed watercourses crossing near the highway and linking to the marshes), due to degradation of water quality during the construction period;
 - Loss of standing water where infrastructure upgrades are constructed through or close to existing ponds or ditches;

- Indirect loss or changes to surface waters as a result of dewatering groundwater aquifers;
- Pollution during road operation due to contaminants within routine road run-off. A broad range of potential pollutants, such as hydrocarbons i.e. fuel and lubricants, fuel additives, metal from corrosion of vehicles, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road surface during rainfall events, polluting the receiving surface water bodies;
- Pollution during road operation due to accidental spillage. On all roads, there is a risk that accidents or vehicle fires may lead to an acute pollution incident. Where commercial vehicles are involved, potential pollutants that may be spilled could range from hazardous chemicals to milk, alcoholic beverages, organic sludges and detergents. Spilled materials may drain from the road surface, polluting the receiving surface water bodies; and
- Loss or change to surface water supplies due to degradation of water quality, changes in drainage patterns or disruption to supply infrastructure.

Groundwater

10.2.2 The Proposed Scheme has the potential to result in adverse impact upon groundwater resources. It is proposed that the following elements of assessment are scoped into the EIA:

- Pollution of groundwater and aquifers as a result of construction activities, such as excavation of cuttings; piling creating preferential pathways for contamination transmission to groundwaters, and seepage of spillages through ground profiles;
- Direct loss or changes to groundwater aquifers and groundwater supplies (licensed or unlicensed), either within the footprint of the Proposed Scheme or as a result of changes to groundwater flows and levels associated with dewatering of cuttings and foundation excavations or piling into the aquifer;
- Pollution of Groundwater Dependent Terrestrial Ecosystems, such as Chattenden Woods SSSI (located approximately 460m north-west of Phase 2) and Medway Estuary & Marshes SSSI (located approximately 1.2km south-east of Phase 2), as a result of construction activities or direct loss/ changes to groundwater flows; and
- Impacts upon groundwater resources from road runoff and the accidental spillage of pollutants.

Potential Impacts of Flooding

10.2.3 Proposed Scheme will cross the floodplain in a few locations where unnamed drains and watercourses cross near or are culverted beneath roads associated with the scheme. There is a risk of flooding associated with the areas where the watercourses cross the Proposed Scheme. In these areas the road is raised above the floodplain and therefore at low risk of

flooding. However, extending the footprint of this road through widening the carriageway and creating a wider embankment will remove some of the flood storage area.

10.2.4 The floodplain of the River Medway is situated approximately 650m to the south of the Phase 2. It is not anticipated that the formal flood defences along the River Medway would be affected by the scheme.

10.2.5 The Proposed Scheme has the potential to result in adverse impact in relation to flooding during construction and operation. It is proposed that the EIA considers the changes in flood risk caused by the Proposed Scheme, both within the proposed improvement works and also elsewhere in the catchment is possible. This can involve a number of interrelated factors including:

- Increases in water level due to Proposed Scheme within the channel or floodplain;
- Loss of floodplain storage due to road infrastructure occupying areas which were previously available for flood storage or flows;
- Impacts upon the conveyance of floodwater and impediment of water flow caused by road infrastructure crossing existing drainage channels, causing potential blockage and altering local catchment area boundaries;
- The increase in surface water runoff due to any increase in impermeable area as a result of the Proposed Scheme; and
- The risk to the Proposed Scheme from flooding from groundwater, sewer and artificial sources.

10.3. Impacts to be Scoped Out

10.3.1 The proposed scheme is not situated within an area at risk of flooding from reservoirs. It is therefore proposed that flooding from reservoirs is scoped out the EIA.

10.4. Proposed Assessment Methodology

10.4.1 The water Environment Impact Assessment will involve the following key tasks:

- Consultation with relevant statutory and non-statutory bodies to establish the principal water environment issues associated with the study area;
- Detailed desk studies and field surveys to ascertain the current baseline conditions at the Site;
- Assessment of the potential impacts related to the construction and operation of the Proposed Scheme; and

- Identification of measures to avoid, minimise or mitigation predicted impacts upon the water environment.

10.4.2 The assessment will focus on defining the characteristics and subsequent potential impacts upon surface and groundwater receptors including the wider hydrological catchment as categorised by the Environment Agency under the Water Framework Directive.

Loss or change to surface water receptors during Construction

10.4.3 Evaluation of the potential for pollution of surface waters as a result of spillage and of the release of sediments into watercourses or water bodies will involve a review of areas where construction would be required within or in close proximity (i.e. within 50m) to surface watercourses and water bodies. Mobilisation of potentially contaminated sediments during construction will also be considered in terms of local receptors, including surface or groundwater supplies (both licensed and unlicensed).

10.4.4 The potential for pollution of groundwaters/aquifers is greatest where piling through contaminated land or sediments is proposed. In addition, groundwater vulnerability is classified as high for this area and therefore groundwater is more at risk from accidental spillage.

Pollution from Routine Run-off

10.4.5 DMRB guidance document LA 113: Road Drainage and the Water Environment (Highways England, 2020) specifies procedures for the assessment of pollution impacts from routine run-off on surface waters. This would include:

- HEWRAT Assessment: the Highways England Water Risk Assessment Tool (HEWRAT) to assess the short-term risks related to the intermittent nature of road run-off. It assesses the acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment-bound pollutants, respectively; and
- Environmental Quality Standards (EQS) Assessment: EQS are the maximum permissible annual average concentrations of potentially hazardous chemicals, as defined under the WFD. The long-term risks over the period of one year are assessed through comparison of the annual average concentration of pollutants discharged with the published EQS for those pollutants.

Pollution from Accidental Spillage

10.4.6 DMRB guidance document LA 113 specifies procedures for the assessment of pollution impacts from accidental spillage. The assessment takes the form of a risk assessment, where the risk is expressed as the annual probability of a serious pollution incident occurring. This risk is the product of two probabilities:

10.4.7 The probability that an accident will occur, resulting in a serious spillage of a polluting substance on the carriageway; and

- 10.4.8 The probability that, if such a spillage did occur, the polluting substance would reach the receiving water body and cause a serious pollution incident.

Loss or changes to groundwater aquifers and supported water supplies

- 10.4.9 As assessment of the potential impacts of the Proposed Scheme on groundwater quality and quantity will be undertaken with respect to identified abstractions including licensed, unlicensed and private water supplies and other groundwater dependant receptors (such as Groundwater Dependent Terrestrial Ecosystems).

Indirect Loss or changes to surface water receptors

- 10.4.10 Surface Water bodies such as streams, lakes and wetlands can receive or recharge groundwater, with movement likely between receptors. Changes to groundwater as a result of dewatering may indirectly impact surface water bodies and result in changes to surface water flow. These impacts shall be assessed qualitatively.

Water Framework Directive Assessment

- 10.4.11 A WFD Assessment will be undertaken to assess the Proposed Scheme against the key objectives of the Water Framework Directive. A WFD scoping exercise will be undertaken and consulted on with the Environment Agency.

Flood Risk

- 10.4.12 A Flood Risk Assessment (FRA) will be carried out in accordance with the National Planning Policy Framework (NPPF) and the NPPF Planning Practice Guidance (PPG), including consideration of the Sequential and Exception Tests. The objectives of the FRA are to:

- Assess the risk to the Proposed Scheme from all potential sources of flooding;
- Establish the existing and future flood risk to the Proposed Scheme;
- Consider flood risk to the Proposed Scheme site during construction;
- Assess the potential impacts of the Proposed Scheme on flood risk elsewhere; and
- Determine appropriate mitigation measures to manage flooding issues post development in a sustainable way.

- 10.4.13 Regarding climate change allowances, the Environment Agency Flood risk assessment: climate change allowances guidance will be referred to which uses peak river flow, peak rainfall intensity and sea level data from different sites around England to classify suitable allowances for the site. It is currently unknown what modelling will be used to inform the FRA but it is likely that consultation with the Environment Agency during the FRA process will result in the provision of modelling information generated by or for the Environment Agency for the Kent or Medway region.

Assessment of Significance

10.4.14 Levels of significance will be assessed in line with the standard approach presented in Section 4.3.

10.4.15 The importance or sensitivity of waterbodies will be evaluated taking into account their quality, rarity, scale and substitutability. The magnitude of impacts will be evaluated taking into account the extent of loss and effects on integrity of the relevant waterbody attributes. The criteria used is based on the guidance and examples presented in the NPPF and DMRB guidance document and are detailed within the following sub sections.

Assessing Importance or Sensitivity

10.4.16 The importance or sensitivity of the waterbodies is evaluated taking into account their quality, rarity, scale and substitutability. The following standard terms will be applied to the ES when determining the importance or sensitivity of water environment attributes, including surface water attributes, groundwater attributes and assets vulnerable to flood risk:

- High: The receptor/resource has little ability to absorb change without fundamentally altering its present character or is of international or national importance;
- Medium: The receptor/resource has moderate capacity to absorb change without significantly altering its present character, or is of high importance; and
- Low: The receptor/resource is tolerant of change without detriment to its character, is of low or local importance.

Table 36: Criteria for estimating the importance of water environment attributes

Importance	Example
Very High: Attribute has a high quality and rarity on regional or national scale	<p>Surface Water</p> <p>Large or medium watercourses with pristine / near pristine water quality, i.e. Water Framework Directive (WFD) Class 'High'.</p> <p>Site protected/designated under EU or UK habitat legislation: Special Areas of Conservation (SAC), Special Protection Area (SPA), Site of Special Scientific Interests (SSSI), Water Protection Zone (WPZ), Ramsar site, species protected by EU legislation.</p> <p>Watercourses supporting a wide range of significant species and habitats sensitive to changes in suspended sediment concentrations and turbidity such as salmon or freshwater pearl mussels. Water dependent ecosystems of international/ national biodiversity value.</p> <p>Water feature sediment regime provides a diverse mosaic of habitat types.</p> <p>Water feature includes varied morphological features (e.g. pools, riffles, bars, natural bank profiles) with no sign of channel modification.</p> <p>A watercourse and associated abstraction boreholes used for public water supply or private water supply serving >10 properties.</p> <p>Water body of high amenity value, including areas of bathing and where water emersion sports are regularly practised.</p>

Importance	Example
	<p>Groundwater</p> <p>Principal Aquifer providing a regionally important resource or supporting site protected under EC and UK habitat legislation.</p> <p>Source Protection Zone (SPZ) 1.</p>
	<p>A groundwater body and associated abstraction boreholes used for public water supply or private water supply serving >10 properties.</p>
	<p>Flood Risk</p> <p>Essential infrastructure including:</p> <p>Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.</p> <p>Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.</p> <p>Wind turbines.</p> <p>Highly vulnerable development including:</p> <p>Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.</p> <p>Emergency dispersal points.</p> <p>Basement dwellings.</p> <p>Caravans, mobile homes and park homes intended for permanent residential use.</p> <p>Installations requiring hazardous substances consent.</p> <p>(Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations,</p> <p>or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').</p>
High:	<p>Surface Water</p>
Attribute has a high quality and rarity on local scale	<p>Medium or small watercourses with minor degradation of water quality as a result of anthropogenic factors. Water body of good chemical and biological quality i.e. WFD Class 'Good'.</p> <p>Species protected under UK legislation</p> <p>Water dependent ecosystems of regional/county biodiversity value. Watercourses supporting some species and habitats sensitive to changes in suspended sediment concentrations and turbidity.</p> <p>Water feature sediment regime provides habitats suitable for species sensitive to changes in sediment concentration and turbidity.</p> <p>Water feature exhibiting a natural range of morphological features (e.g. pools, riffles, bars, varied natural riverbank profiles), with limited signs of artificial modifications or morphological pressures.</p>

Importance	Example
	A watercourse body and associated abstraction boreholes supporting minor/non-critical public drinking water supplies, or private water supply serving 2-10 properties.
	Water body of a moderate amenity value including public parks, boating, non-contact water sports, popular footpaths adjacent to watercourses, or watercourses running through housing developments/ town centres.
	Groundwater
	Principal Aquifer providing locally important resource or supporting river ecosystem. SPZ 2. A groundwater body and associated abstraction boreholes supporting minor/non-critical public drinking water supplies, or private water supply serving 2-10 properties.
	Flood Risk
	Development that is more vulnerable to flooding including: Hospitals. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. Non-residential uses for health services, nurseries and educational establishments. Landfill and sites used for waste management facilities for hazardous waste. Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.
Medium: Attribute has a medium quality and rarity on local scale	Surface Water
	Small watercourses with degradation of water quality as a result of anthropogenic factors. WFD Class of 'Moderate'.
	Water dependent ecosystems of county/district biodiversity value.
	Watercourses supporting limited species and habitats sensitive to changes in suspended sediment concentrations and turbidity.
	Water feature sediment regime provides some habitat suitable for species sensitive to change in suspended sediment concentrations or turbidity.
	Water feature exhibiting some morphological features (e.g. pools, riffles and depositional bars). The channel cross-section is partially modified in places, with obvious signs of modification to the channel morphology.
	A watercourse and associated abstraction boreholes supporting a private water supply serving a single property, or for agricultural/industrial use.
	Water body of particular local social/cultural/educational interest. Water body of low amenity value with only casual access, e.g. along a road or bridge in a rural area.
	Groundwater
	Aquifer with limited connection to surface water.
	SPZ 3.

Importance	Example
	<p>A groundwater body and associated abstraction boreholes supporting a private water supply serving a single property, or for agricultural/industrial use.</p> <p>Flood Risk</p> <p>Development that is less vulnerable to flooding including:</p> <p>Police, ambulance and fire stations which are not required to be operational during flooding.</p> <p>Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.</p> <p>Land and buildings used for agriculture and forestry.</p> <p>Waste treatment (except landfill and hazardous waste facilities).</p> <p>Minerals working and processing (except for sand and gravel working).</p> <p>Water treatment works which do not need to remain operational during times of flood.</p> <p>Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.</p>
Low:	Surface Water
Attribute has a low quality and rarity on local scale	<p>Small, heavily modified watercourses or drains with poor water quality as a result of anthropogenic factors.</p> <p>Water of poor or bad chemical or biological quality, i.e. WFD Class of 'Poor' or 'Bad'.</p> <p>Water dependent ecosystems of local/less than local biodiversity value.</p> <p>Watercourses which do not support any significant species and habitats sensitive to changes in suspended sediment concentrations and turbidity.</p> <p>Water feature sediment regime which provides very limited physical habitat for species sensitive to changes in suspended solids concentration or turbidity.</p> <p>Water feature that has been extensively modified (e.g. by culverting, addition of bank protection or impoundments) and exhibits limited-to-no morphological diversity. The water feature is likely to have uniform flow, uniform banks and absence of bars. Insufficient energy for morphological change.</p> <p>Watercourses not supporting water abstractions.</p> <p>Borehole without abstractions.</p> <p>Water body of no amenity value, seldom used for amenity purposes, in a remote or inaccessible area.</p> <p>Groundwater</p> <p>Non-Aquifer.</p> <p>Flood Risk</p> <p>Water-compatible development:</p> <p>Flood control infrastructure.</p> <p>Water transmission infrastructure and pumping stations.</p>

Importance	Example
	<p>Sewage transmission infrastructure and pumping stations.</p> <p>Sand and gravel working.</p> <p>Docks, marinas and wharves.</p> <p>Navigation facilities.</p> <p>Ministry of Defence defence installations.</p> <p>Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.</p> <p>Water-based recreation (excluding sleeping accommodation).</p> <p>Lifeguard and coastguard stations.</p> <p>Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.</p> <p>Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan</p>

10.4.17 The criteria for assessing the magnitude of an impact is shown within Table 38, below. The criteria considers both potential positive and negative impacts.

Table 37: Criteria for estimating the magnitude of an impact on an attribute (reproduction of Table 3.71 published in DMRB guidance document LA113)

Magnitude	Criteria	Typical examples	
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface water:	<p>Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT and compliance failure with EQS values. Calculated risk of pollution from a spillage $\geq 2\%$ annually (spillage assessment).</p> <p>Loss or extensive change to a fishery.</p> <p>Loss of regionally important public water supply.</p> <p>Loss or extensive change to a designated nature conservation site.</p> <p>Reduction in water body WFD classification.</p>
		Groundwater:	<p>Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Potential high risk of pollution to groundwater from routine runoff - risk score > 250 (Groundwater quality and runoff assessment). Calculated risk of pollution from spillages $\geq 2\%$ annually (Spillage assessment). Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies.</p> <p>Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects</p>
		Flood risk:	Increase in peak flood level ($> 100\text{mm}$).

Magnitude	Criteria	Typical examples	
Moderate adverse	Results in effect on integrity of attribute, or loss of part of attribute	Surface water:	<p>Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values.</p> <p>Calculated risk of pollution from spillages $\geq 1\%$ annually and $< 2\%$ annually.</p> <p>Partial loss in productivity of a fishery.</p> <p>Degradation of regionally important public water supply or loss of major commercial/ industrial/ agricultural supplies.</p> <p>Contribution to reduction in water body WFD classification.</p>
		Groundwater:	<p>Partial loss or change to an aquifer.</p> <p>Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250.</p> <p>Calculated risk of pollution from spillages $\geq 1\%$ annually and $< 2\%$ annually.</p> <p>Partial loss of the integrity of GWDTE</p> <p>Contribution to reduction in water body WFD classification.</p> <p>Damage to major structures through subsidence or similar effects or loss of minor structures.</p>
		Flood risk:	Increase in peak flood level ($> 50\text{mm}$).
Minor adverse	Results in some measurable change in attributes, quality or vulnerability	Surface water:	<p>Failure of either acute soluble or chronic sediment related pollutants in HEWRAT.</p> <p>Calculated risk of pollution from spillages $\geq 0.5\%$ annually and $< 1\%$ annually.</p> <p>Minor effects on water supplies.</p>
		Groundwater:	<p>Potential low risk of pollution to groundwater from routine runoff - risk score < 150.</p> <p>Calculated risk of pollution from spillages $\geq 0.5\%$ annually and $< 1\%$ annually</p> <p>Minor effects on an aquifer, GWDTEs, abstractions and structures.</p>
		Flood risk:	Increase in peak flood level ($> 10\text{mm}$)
Negligible	Results in effect on attribute, but of insufficient magnitude to	The proposed project is unlikely to affect the integrity of the water environment.	
		Surface water:	No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages $< 0.5\%$.

Magnitude	Criteria	Typical examples	
	affect the use or integrity	Groundwater:	No measurable impact upon an aquifer and/or groundwater receptors and risk of pollution from spillages <0.5%.
		Flood risk:	Negligible change to peak flood level ($\leq \pm 10\text{mm}$).
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Surface water:	HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
		Groundwater:	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually). Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
		Flood risk:	Creation of flood storage and decrease in peak flood level (> 10mm).
Moderate beneficial	Results in moderate improvement of attribute quality	Surface water:	HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually). Contribution to improvement in water body WFD classification.
		Groundwater:	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually). Contribution to improvement in water body WFD classification. Improvement in water body catchment abstraction management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE.
		Flood risk:	Creation of flood storage and decrease in peak flood level 1 (>50mm).
Major beneficial	Results in major improvement of attribute quality	Surface water:	Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Improvement in water body WFD classification.
		Groundwater:	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.

Magnitude	Criteria	Typical examples	
		Flood risk:	Creation of flood storage and decrease in peak flood level (>100mm).
No change		No loss or alteration of characteristics, features or elements; no observable impact in either direction.	

10.5. Assumptions and Limitations

- 10.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.
- 10.5.2 The required construction footprint for the Proposed Scheme is yet to be determined. It is anticipated that this is to be refined within the ES.

10.6. References

- Environment Agency Catchment Data Explorer
<https://environment.data.gov.uk/catchment-planning/>
- Highways England 2020 Sustainability & Environment Appraisal (LA 113): Road Drainage and the Water Environment (Revision 1 March 2020) (formerly HD 45/09)
- Ministry of Housing, Communities & Local Government 2019 *National Planning Policy Framework (NPPF)*
- Geosphere Environmental (March 2020) *Phase 1 –Desk Study and Preliminary Risk Assessment* (Report Reference: 4496,DS/DESK/AT,TP/17-03-20/V1)

11. Climate

11.1. Scoping Baseline

Greenhouse Gas Emissions

- 11.1.1 In the baseline (do nothing) scenario, GHG emissions occur constantly and widely as a result of human and natural activity including energy consumption (fuel, power), industrial processes, land use and land use change – both in the area of the Proposed Scheme but also more widely.
- 11.1.2 No construction works associated within the Proposed Scheme would take place in the ‘do nothing’ scenario. The operation and management of the current assets are likely to require a small number or volume specialist components (for example, light bulbs, signage steelwork, kerbstones) as well as some bulk material (e.g. asphalt for minor re-surfacing) for routine maintenance and repair works. These materials will have embodied GHG emissions associated with them. Due to the small materials quantities required, however, GHG emissions are likely to be negligible. The ‘do nothing’ option would be unlikely to change the emission sources generated by the current consumption of materials within the Application Site for the Scheme.
- 11.1.3 The total end-user GHG emissions from traffic flows in the ‘do nothing’ (baseline) scenario have not yet been modelled, however, this will be completed as part of the air quality assessment. The modelling will include the total GHG emissions for all vehicles covered by the traffic model, including the strategic and local road network in the area of the Proposed Scheme and its surrounding region – this modelling will be inherently cumulative.

Vulnerability of the Proposed Scheme to Climate Change

- 11.1.4 Relevant attributes of the Proposed Scheme that may be vulnerable to climate change have been identified, whilst considering the impact of extreme weather and changes in climate on the Scheme over its lifetime. Receptors associated with the Proposed Scheme include:
- Road receptors, including:
 - A289 Hasted Road, Higham Road, Islingham Farm Road, Woodfield Way, Upchat Roundabout, Chattenden Lane, proposed Relief Road, Main Road Hoo Roundabout, A228 Peninsula Way, Bells Lane Roundabout, Ropers Lane Roundabout, Four Elms Roundabout and Sans Pareil Roundabout.
 - Areas of carriageway/ central reserve widening;
 - Signals, priorities and signage;
 - MOD accommodation works such as crossing points;
 - Roundabout improvements; and
 - Slip road additions

- Cycle and pedestrian receptors, including:
 - New pedestrian/ cycle crossing facilities along Woodfield Way and the proposed Relief Road, and at Four Elms Roundabout; and
- Proposed drainage and attenuation.

11.1.5 The baseline conditions at the Application Site and surrounding area have been considered when establishing the potential vulnerability of the scheme to climate change, in line with climate variables. These are presented in Table 38.

Table 38: Vulnerability of the Proposed Scheme to Climate Change

Existing Baseline Conditions	Climate Variable	Vulnerable
Sea		
The Proposed Scheme is approximately 4km from the River Medway estuary and approximately 12km from the North Sea. The River Medway, to the south of the site, is tidally influenced.	Sea Level Rise	Yes
	Storm Surge and Storm Tide	Yes
	Sea Surface Temperature	No
	Currents and waves	No
Precipitation		
The Proposed Scheme either crosses or is found close to a number of unnamed drains. The scheme includes earthworks that could be impacted by prolonged dry periods and drought.	Change in annual average	Yes
	Drought	Yes
	Extreme precipitation events (flooding)	Yes
Temperature		
The existing carriageways, bridges, cycle infrastructure and footways may be sensitive to extreme temperatures. Although these elements could be sensitive to extreme temperatures (heatwaves), it is unlikely that they will be highly sensitive to long term changes in average temperatures.	Changes in annual average	No
	Extreme temperature events	Yes
	Solar radiation	Yes
Wind		
The existing carriageway, cycle and footway users may also be sensitive to high winds. Associated infrastructure such as signage or signals could also be damaged by high winds and storm events.	Gales and extreme wind events	Yes
	Storms (snow lightening, hail)	Yes
Relative Humidity		
Humidity and evaporation are likely to have little direct effect on the existing carriageway road, cycle and footways.	Changes in annual average	No
	Evaporation	No
Soils		
The existing roads, bridges, cycle infrastructure and footways are all likely to be sensitive to soil stability.	Soil moisture	Yes
	Salinity / pH	Yes
	Runoff	Yes
	Soil Stability	Yes

11.2. Potential Impacts of the Proposed Scheme

Greenhouse Gas Assessment:

- 11.2.1 The impacts of GHGs relate to their contribution to global warming and climate change. These impacts are global and cumulative in nature, with every tonne of GHG contributing to climate change impacts upon natural and human systems.

Construction:

- 11.2.2 The Proposed Scheme has the potential to result in GHG impacts at various project lifecycle stages. The following potential construction phase impacts will be considered within the EIA:
- Product Stage: The EIA will consider the manufacture and transportation of raw materials to suppliers (e.g. the supply of aggregates and asphalt).
 - Construction Process Stage: The EIA will consider the planned construction activities associated with the Proposed Scheme, including:
 - The delivery and laying of materials for the new relief road, carriageway and central reserve widening, roundabout junction improvements, cycleways and footways;
 - Disposal of site arisings;
 - Delivery and installation of materials and equipment for drainage, service, barriers, signage and lighting; and
 - Land use and land use changes

Operation:

- 11.2.3 The assessment for changes to GHG emissions will consider changes arising from vehicles movements facilitated by the Proposed Scheme. Change in end-user emissions expected from the surrounding network and this will be included within Air Quality assessment. The climate change assessment will cross reference the Air Quality assessment.

Vulnerability of the Proposed Scheme to Climate Change

- 11.2.4 Considering the site setting, there exists the potential for the Proposed Scheme to be impacted by future climate changes. It is proposed that the following elements are scoped into the Climate Resilience assessment.

Impacts during construction as a result of sea level rise:

- 11.2.5 Sea level rise has the potential to impact the tidal River Medway near to the site, which could increase flood risk to parts of the Proposed Scheme. This increases the risk of damage, delay, health and safety impacts and can cause increased costs during the construction phase.

Impacts during construction as a result of storm surges and storm tides:

- 11.2.6 Storm surges and storm tides have the potential to impact the tidal River Medway near to the site, which could increase flood risk to the eastern and western parts of the Proposed Scheme.

This increases the risk of damage, delay, health and safety impacts and can cause increased costs during the construction phase.

Impacts during construction as a result of extreme weather:

- 11.2.7 Extreme weather events increase the risk of damage, delay, health and safety impacts, increased costs during the construction phase.

Impacts during construction as a result of increased temperatures, prolonged periods of hot weather:

- 11.2.8 Warm and dry conditions exacerbate dust generation and dispersion, health risks to construction workers.

Impacts during construction as a result of increased precipitation, and intense periods of rainfall:

- 11.2.9 Increased or intense rainfall has the potential to impact construction through:
- Flooding of works and soil erosion;
 - Increased risk of contamination of waterbodies;
 - Disruption to supply of materials and goods; and
 - Landslides.

Impacts during operation as a result of sea level rise:

- 11.2.10 Sea level rise could affect the tidal River Medway, which could increase flood risk to the eastern and western parts of the Proposed Scheme. Increased flood risk and flooding as a result of increased sea levels could mean that roads, cycle infrastructure and footways are impassable. Flooding may also cause damage to paved surfaces (leading to increased maintenance requirements).

Impacts during operation as a result of storm surges and storm tides:

- 11.2.11 Storm surges and storm tides have the potential to impact the tidal River Medway near to the site, which could increase flood risk to the eastern and western parts of the Proposed Scheme. Increased flood risk and flooding as a result of increased sea levels could mean that roads, cycle infrastructure and footways are impassable. Flooding may also cause damage to paved surfaces (leading to increased maintenance requirements).

Impacts during operation as a result of changes in precipitation:

- 11.2.12 Roads, bridges cycle infrastructure and footways are sensitive to high rainfall. An average increase in winter rainfall may cause roads, cycle infrastructure and footways to become flooded due to flooding of local watercourses (fluvial flooding) or surface water flooding (pluvial flooding). Flooding may mean that roads, cycle infrastructure and footways are impassable. Flooding may also cause damage to paved surfaces (leading to increased maintenance requirements).

Roads, bridges, cycle infrastructure and footways are also sensitive to extreme rainfall events which, in addition to flooding, may also lead to destabilisation of soils and earthworks, potentially leading to temporary or permanent loss of amenity.

11.2.13 Roads, cycle infrastructure and footways are also sensitive to low rainfall or drought. Prolonged dry periods may lead to drying out and cracking of earthworks and soils.

11.2.14 Considering the above, it is proposed that the climate resilience assessment considers potential impacts associated with:

- Change in annual average precipitation;
- Drought; and
- Extreme precipitation events (flooding).

Impacts during operation as a result of changes in temperature:

11.2.15 Roads, bridges, cycle infrastructure and footways are sensitive to extreme temperatures. High temperatures may cause damage to paved surfaces, including potential melting and deformation. An increase in solar radiation can also cause more rapid deterioration of materials and associated infrastructure such as signage. Bridges are sensitive to high temperatures which affect thermal expansion joints and increase earth pressures.

11.2.16 It is therefore proposed that the climate resilience assessment considers:

- Extreme temperature events; and
- Solar radiation.

Impacts during operation as a result of changes in wind:

11.2.17 Road, cycle infrastructure and footway users may also be sensitive to high winds. Associated infrastructure such as signage or signals could also be damaged by high winds and storm events. It is therefore proposed that the climate resilience assessment considers:

- Gales and extreme wind events; and
- Storms (snow lightening, hail).

Impacts during operation as a result of changes to soil:

11.2.18 Roads, bridges, cycle infrastructure and footways are all sensitive to soil stability. Soil stability can be reduced as a result of extreme rainfall or prolonged periods of rainfall which can lead to waterlogging, as well as extreme temperatures and drought which can cause soils to dry out and crack. Earthworks and embankments associated with roads, bridges, cycle infrastructure and footways are particularly sensitive to changes in soil stability. Roads, cycle infrastructure and footways are also sensitive to an increase in soil runoff, increasing the amount of sediment on paved surfaces and reaching drains, potentially leading to blockages.

- 11.2.19 Water availability can cause a number of impacts to water quality and soils. For example, greater water volumes can increase the mobilisation of pollutants in soils whilst water scarcity can increase the accumulation of chemicals and pollutants which may cause increased salinity and acidification.
- 11.2.20 Structure foundations may be sensitive to changes in soil chemistry.
- 11.2.21 Considering the above, it is proposed that the climate resilience assessment considers potential impacts associated with:
- Soil moisture;
 - Salinity / pH;
 - Runoff; and
 - Soil stability.

11.3. Impacts to be Scoped Out

Greenhouse Gas Assessment

- 11.3.1 It is proposed that impacts in relation to forestry are scoped out of the GHG assessment as no forestry receptors will be affected by the Proposed Scheme.
- 11.3.2 It is proposed that impacts from the physical operation of the Proposed Scheme are scoped out of the GHG assessment (as separate to those arising from the traffic flows utilising the Proposed Scheme). The lighting used within the expected to be efficient LED units providing some reduction in emissions compared to the baseline.
- 11.3.3 It is proposed that decommissioning is scoped out, in line with the proposed assessment scenarios presented in Section 4.2. The end of life stage has been scoped out as the expected timescales for decommissioning are so far into the future that there is insufficient certainty about the likelihood, type or scale of emissions activity.

Vulnerability of the Proposed Scheme to Climate Change

- 11.3.4 As the Proposed Scheme is situated near to the coast and a tidally influenced watercourse, some impacts relating to the sea will be considered within the EIA, as specified above. However, impacts associated with sea surface temperatures and currents and waves are scoped out of the climate vulnerability assessment as no significant effects are likely to be experienced.
- 11.3.5 The road, cycle infrastructure and footway elements are sensitive to extreme temperatures (heatwaves) but not highly sensitive to long term changes in average temperatures. It is therefore proposed that impacts associated with changes to annual average temperatures is scoped out of the climate vulnerability assessment as no significant effects are likely to be experienced.

- 11.3.6 Humidity and evaporation have little direct effect on the road, cycle infrastructure and footway elements. It is therefore proposed that impacts associated with the changes to annual average humidity and evaporation are scoped out as no significant effects are likely to be experienced.

11.4. Proposed Assessment Methodology

Greenhouse Gas Assessment

- 11.4.1 The GHG assessment will be undertaken in accordance with the DMRB guidance document LA114: Climate.
- 11.4.2 The assessment shall report on the likely additional and avoided GHG emissions at each life cycle stage of the project, in comparison with current and future baseline GHG emissions.
- 11.4.3 The assessment will consider:
- Whether the construction emissions (or GHG-emitting activity) will result in a greater than 1% increase in GHG emissions, when compared to the baseline scenario.
 - Whether operation of the carriageway will meet or exceed any of the following:
 - A change of more than 10% in AADT;
 - A change of more than 10% to the number of heavy-duty vehicles; and
 - A change in daily average speed of more than 20 km/hr.
- 11.4.4 GHG emissions shall be calculated and reported for each of the project life cycle stages as required by the scope of the assessment to establish the 'do something' scenario.
- 11.4.5 DMRB guidance LA114 outlines the project life cycle stages and potential sources of GHG emission data that will be obtained to inform the GHG assessment (presented in Table 39).

Table 39: Sources of GHG emission data to be used in the GHG assessment (adapted from Table 3.11.1 published in DMRB guidance document LA113)

Main stage of project life cycle	Sub-stage of life cycle	Potential sources of GHG emissions (not exhaustive)	Examples of activity data
Construction stage	Product stage; including raw material supply, transport and manufacture.	Embodied GHG emissions associated with the required raw materials.	Materials quantities.
	Construction process stage; including transport to/from works site and construction /installation processes.	Activities for organisations conducting construction work.	Fuel/electricity consumption. Construction activity type/duration. Transportation of materials from point of purchase to site, mode/distance. Area of land use change.

Main stage of project life cycle	Sub-stage of life cycle	Potential sources of GHG emissions (not exhaustive)	Examples of activity data
	Land use change.	GHG emissions mobilised from vegetation or soil loss during construction.	Type and area of land subject to change in usage.
Operation ('use-stage')	Use of the infrastructure by the end-user (road user).	Vehicles using highways infrastructure.	Traffic count/speed by vehicle type for highway links.
Opportunities for reduction	GHG emissions potential of recovery including reuse and recycling GHG emissions potential of benefits and loads of additional functions associated with the study system.	Avoided GHG emissions through substitution of virgin raw materials with those from recovered sources.	Waste and arisings material quantities and recycling/reuse fate.

11.4.6 It is proposed that the GHG emissions calculation for the project life cycle shall be completed using the Highways England carbon calculation tool.

11.4.7 The assessment of projects on climate shall report the quantities of GHG emissions in metric tonnes of carbon dioxide equivalents (tCO₂e). Emissions factor data for user GHG emissions shall enable assessment of the base year, opening year and design (future) year scenarios.

Vulnerability of the Proposed Scheme to Climate Change

11.4.8 It is proposed that the Met Office UKCP18 data is used to assess project's vulnerability to climate change shall use published historical regional weather data to demonstrate the current climate impacts on a study area. UKCP18 provides information on observed and future climate change relative to the baseline period of 1961-1990, based on the latest scientific understanding.

11.4.9 The assessment will aim to identify recent weather patterns and extreme weather events to provide an indication of how the project should account for climate change during the construction phase.

11.4.10 Historical events as a result of weather patterns and extreme weather events, i.e. landslides after heavy rainfall, shall be identified to provide an indication of past vulnerability.

11.4.11 The future changes to the climate baseline shall be identified by considering:

- The life span of the project (including a two-and-a-half-year construction programme. The design life of the project is considered to be 120 years, however as stated within DMRB guidance LL114, the assessment of a project's vulnerability to climate change shall take the life span of the project to be 60 years);
- Climate trends associated with the UKCP high emissions scenario (50% probability) project (using the latest available projections); and
- The environmental baseline under future projected climate conditions.

- 11.4.12 Assessments shall use the H++ climate scenarios to test the sensitivity of vulnerable safety critical features.

Assessment of Significance

GHG Assessment:

- 11.4.13 There are currently no agreed thresholds in published guidance for what level of GHG emissions are considered to be significant in an EIA. IEMA guidance (2015) states that, “in the absence of any significance criteria or a defined threshold, it might be considered that all GHG emissions are significant, and an EIA should ensure the project addresses their occurrence by taking mitigating action” (section 6.1, page 14).
- 11.4.14 IEMA guidance (2015) continues to advise that using professional judgement to contextualise the GHG emissions of the Scheme against pre-determined published carbon budgets will provide a “good practice approach”.

Climate Vulnerability:

- 11.4.15 Where the climate change impact on project receptors is potentially significant, a risk assessment shall be undertaken. The risk assessment shall assess (i) the likelihood; and (ii) the consequence of the impact occurring to each receptor, leading to evaluation of the significance of the effect. The assessment of significance shall:
- Identify the hazards and benefits;
 - Assess the likelihood and consequences; and
 - Evaluate the significance.
- 11.4.16 The assessment of likelihood and consequences will be undertaken in line with the framework published in DMRB guidance document LA114. This is reproduced in Table 40 and Table 41.

Table 40: Likelihood categories for climate vulnerability assessments (reproduction of Table 3.39a published in DMRB guidance document LA113)

Likelihood category	Description (probability and frequency of occurrence)
Very High	The event occurs multiple times during the lifetime of the project (60 years) e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the project (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years) e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the project (60 years) e.g. once in 60 years.
Very Low	The event can occur once during the lifetime of the project (60 years).

Table 41: Measure of consequence for climate resilience assessments (reproduction of Table 3.39b published in DMRB guidance document LA113)

Consequence of impact	Description
Very Large Adverse	Operation - national level (or greater) disruption to strategic route(s) lasting more than 1 week.
Large Adverse	Operation - national level disruption to strategic route(s) lasting more than 1 day but less than 1 week or regional level disruption to strategic route(s) lasting more than 1 week.
Moderate Adverse	Operation - regional level disruption to strategic route(s) lasting more than 1 day but less than 1 week.
Minor Adverse	Operation - regional level disruption to strategic route(s) lasting less than 1 day.
Negligible	Operation - disruption to an isolated section of a strategic route lasting less than 1 day.

11.4.17 For the construction phase, a qualitative description of disruption risk shall be reported.

11.4.18 The significance of effect will be determined by combining the likelihood and consequence of in the form of a matrix. This significance matrix, published in DMRB guidance document LA114, is reproduced in Table 42. It is proposed that the assessment of climate resilience is undertaken in accordance with this approach, which departs overarching approach presented in Table 4. As shown in Table 42, for climate resilience effects are deemed to be either significant or not significant, as opposed to placing effects on a scale of significance.

Table 42: Climate Resilience Significance Matrix

		Measure of Likelihood				
		Very Low	Low	Medium	High	Very High
Measure of consequence	Very large adverse	Not Significant	Significant	Significant	Significant	Significant
	Large adverse	Not Significant	Not Significant	Significant	Significant	Significant
	Moderate adverse	Not Significant	Not Significant	Significant	Significant	Significant
	Minor adverse	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant
	Negligible	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

11.5. Assumptions and Limitations

11.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.

- 11.5.2 The total end-user GHG emissions from traffic flows in the 'do nothing' (baseline) scenario have not yet been modelled and have therefore not been available to inform this report.
- 11.5.3 The required construction footprint for the Proposed Scheme is yet to be determined. It is anticipated that this is to be refined within the ES.

11.6. References

- Highways England 2019 Sustainability & Environment Appraisal (LA 114): Climate (Revision 0 October 2019)
- Institute of Environmental Management and Assessment 2015 *Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation*

12. Population and Human Health

12.1. Scoping Baseline

Population

- 12.1.1 The Proposed Scheme is situated within the Medway region. Data published by the Office of National Statistics (ONS) estimates that the population of the Medway region in 2019 was 278,000 with 138,100 males and 140,500 females.
- 12.1.2 The Proposed Scheme is covered by three wards: Strood Rural, and Peninsula. The 2013 population estimate for Strood Rural was 9,269 with 4,616 males and 4,653 females. For Peninsula, the 2013 population estimate was 8,787 with 4,303 males and 4,484 females.

Social Deprivation

- 12.1.3 The English Indices of Multiple Deprivation (IMD) 2019 were published on 26th September 2019. The data sources used in each indicator were based on data from the most recent time point available. For the highest weighted domains (Income and Employment) indicators in the IMD 2019 relate to a 2015/16 time point. It is the official measure of relative deprivation for small areas or neighbourhoods in England. The IMD combines information from seven domains to produce an overall relative measure of deprivation. The domains are combined using the following weights:
- Income Deprivation (22.5%);
 - Employment Deprivation (22.5%);
 - Education, Skills and Training Deprivation (13.5%);
 - Health Deprivation and Disability (13.5%);
 - Crime (9.3%);
 - Barriers to Housing and Services (9.3%); and
 - Living Environment Deprivation (9.3%).
- 12.1.4 The IMD average score for Medway in 2019 was 23.94. Medway is ranked 68 out of 151 upper-tier local authority districts (UTLA) on average IMD score. This means that the Medway region is the 84th least deprived UTLA in England.

Employment and Local Economy

- 12.1.5 Data from April 2019 to March 2020 indicates that in the Medway region there are 146, 700 economically active people (over the age of 16), which equates to 81.1% of 16 to 64-year olds.

- 12.1.6 Data for April 2019 to March 2020 indicates that the proportion of individuals aged 16 to 64 who were estimated to be economically active was 81.1% for Medway. These values are higher than the national average for the same time period, which was 79.1%. This data also indicates that for Medway 4.5% of people over the age of 16 and economically active were unemployed, which is higher than the national average of 3.9%.
- 12.1.7 Data for employee jobs from 2018 indicates that for the Medway region, 63.4% of employees were in full-time employment which is lower than the national average of 67.6%. Regarding part-time employment, Medway had a value of 35.5% which was higher than the national average of 32.4%.
- 12.1.8 Table 43, below, details the estimated employee jobs by industry sector in 2018 for the Medway region. In this area, the highest proportion of employee jobs is shown to be Wholesale and Retail Trade and Repair Of Motor Vehicles And Motorcycles Activities (Sector G) at 16.1%. This is a smaller proportion than the average across the South East region (16.4%) but a greater proportion than the national average across Great Britain (15.2%). The construction industry (Sector F) is shown to constitute approximately 6.5% of the workforce (approximately 6,000 jobs) in the Medway region, which is higher than the regional average (5.1%) and national average (4.7%).

Table 43: ONS Data for Employee Jobs by Industry for 2018

Employee Jobs by Industry	Medway (Employee Jobs)	Medway (%)	South East (%)	Great Britain (%)
B : Mining And Quarrying	30	0.0	0.0	0.2
C : Manufacturing	7,000	7.5	6.4	8.1
D : Electricity, Gas, Steam And Air Conditioning Supply	700	0.8	0.4	0.5
E : Water Supply; Sewerage, Waste Management And Remediation Activities	1,000	1.1	0.8	0.7
F : Construction	6,000	6.5	5.1	4.7
G : Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles	15,000	16.1	16.4	15.2
H : Transportation And Storage	6,000	6.5	4.7	4.8
I : Accommodation And Food Service Activities	6,000	6.5	7.4	7.6
J : Information And Communication	2,250	2.4	5.7	4.2
K : Financial And Insurance Activities	3,000	3.2	2.9	3.5
L : Real Estate Activities	1,250	1.3	1.4	1.7
M : Professional, Scientific And Technical Activities	4,500	4.8	9.0	8.7
N : Administrative And Support Service Activities	8,000	8.6	8.9	9.1
O : Public Administration And Defence; Compulsory Social Security	4,000	4.3	3.2	4.3

Employee Jobs by Industry	Medway (Employee Jobs)	Medway (%)	South East (%)	Great Britain (%)
P : Education	11,000	11.8	10.0	8.9
Q : Human Health And Social Work Activities	14,000	15.1	12.8	13.2
R : Arts, Entertainment And Recreation	2,250	2.4	2.7	2.5
S : Other Service Activities	1,500	1.6	2.1	2.0
<p>Source: ONS Business Register and Employment Survey : open access</p> <p>Notes:</p> <p>% is a proportion of total employee jobs excluding farm-based agriculture</p> <p>Employee jobs excludes self-employed, government-supported trainees and HM Forces</p> <p>Data excludes farm-based agriculture</p>				

Land Use

12.1.9 The Agricultural Land Classification maps (2011) are published online by Natural England. An extract of this map is presented in Figure 21.

Agricultural Land

12.1.10 The mapping presents the quality of agricultural land as 5 distinct grades:

- 1 – Excellent (mid-blue);
- 2 – Very Good (light blue);
- 3 – Good to Moderate (green);
- 4 – Poor (yellow); and
- 5 – Very Poor (brown).

12.1.11 Agricultural land within and surrounding the Proposed Scheme is predominantly Excellent in western and eastern parts of the Proposed Scheme and Good to Moderate across the mid-section of the Proposed Scheme to the north of Chattenden and east of Wainscott.

Non-Agricultural Land

12.1.12 According to the key provided by Natural England within the mapping, non-agricultural land is presented in orange and red. Orange is other land primarily in non-agricultural use and can be seen to the west of the Proposed Scheme near Higham.

12.1.13 Land represented by the red colour is land predominantly in urban use. This covers some land immediately south of Phase 1 in Wainscott. It also covers land to the south of the Proposed Scheme within parts of Strood, Frindsbury, Upnor, Rochester and Chatham.

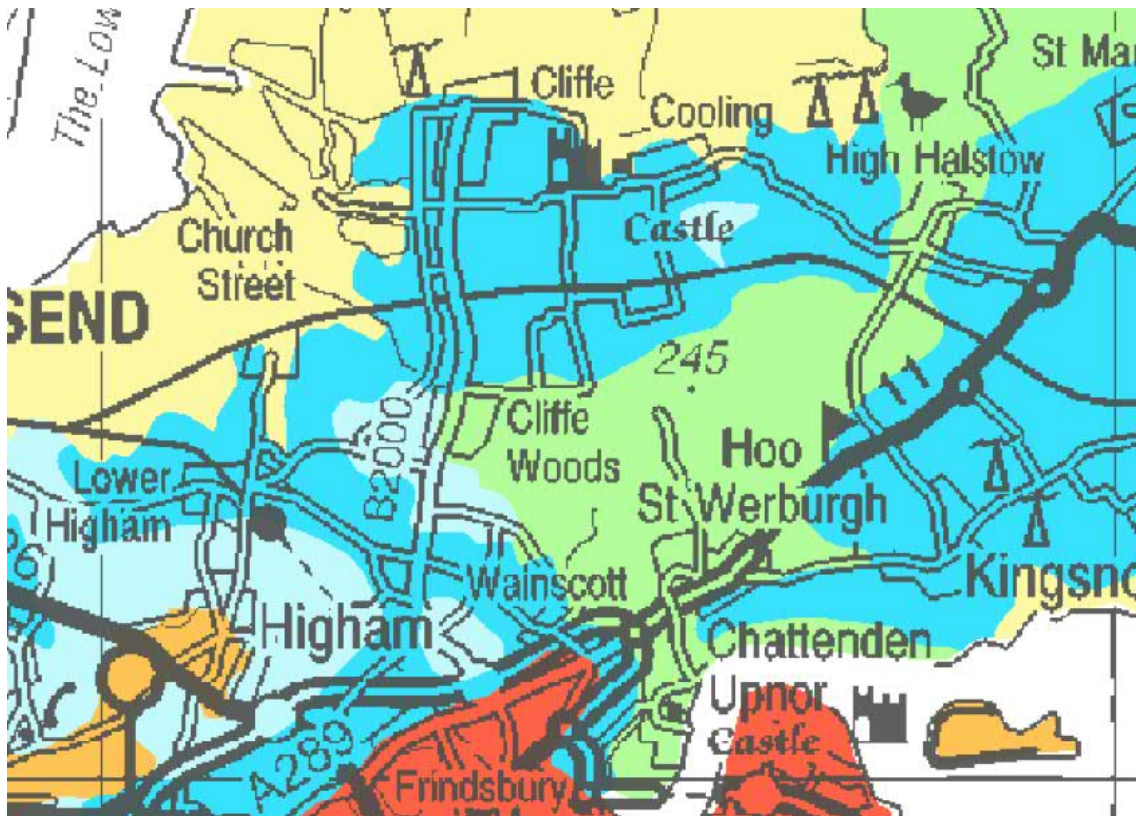


Figure 27: Extract of Agricultural Land Classification map for London and the South East (ALC007)

Public Rights of Way

- 12.1.14 A public right of way (PRoW), can consist of (i) footpaths; (ii) bridleways; (iii) restricted bridleways; (iv) restricted byways; and (v) byways open to all traffic (BOAT).
- 12.1.15 A map showing Kent and Medway PRoW is presented in Appendix A. This shows that the Proposed Scheme intersects with a number of footpaths, bridleways and a byway, with some restricted bridleways passing nearby.

Cycle Routes

- 12.1.16 The location of cycle routes across Kent and the Medway region can be viewed on the Sustrans website which covers the National Cycle Network. A map of these cycle routes can be viewed in Appendix A.
- 12.1.17 As the mapping shows, National Cycle Network routes (both on-road and traffic-free routes) and non-National Cycle Network routes cross on or near to the Proposed Scheme.

Recreation

- 12.1.18 Regarding recreation, playing fields/ spaces exist within 300m south of the Phase 1 in Wainscott. A number of woods exist to the north of the Proposed Scheme, particularly near to Phase 2, which could be used for walking or other recreational activities. An area stated as Hoo Country Park on Google mapping where Deangate Ridge Golf Club used to be is situated to the north of the Proposed Scheme, between Phase 2 and 3. Within southern parts of Phase 3,

sports facilities, including a sports field and bowling green, exist on the eastern side of Bell's Lane. Within 100m north of Phase 3 is a space used for motocross racing and within 400m to the north of Phase 3 is Deangate Ridge Sports Ground, off Dux Court Road.

- 12.1.19 Whilst most of the above specified recreational spaces are not within the immediate vicinity of the Proposed Scheme, the sports facilities within southern parts of Phase 3 have the potential to be impacted by the works.

Health

- 12.1.20 The Air Quality baseline for the Proposed Scheme is presented in Chapter 5. Eastern parts of Phase 2 are part of the Four Elms Hill Air Quality Management Area (AQMA), which is found along parts of the A228 Peninsula Way near Chattenden. Paragraph 5.1.18 in Chapter 5 states that the location of sensitive (human health) receptors will be selected and will include those located within 200m of the selected road links. The selection of sensitive receptors will be dependent on the road links included in the air quality assessment which will depend on the outcome of the traffic model. Figure 17 within Chapter 5 shows the location of the 200m buffer within which human health receptors will be identified.
- 12.1.21 Three nearby areas have undergone noise assessments since 2016 (Bell's Lane, Ratcliffe Highway near Hoo St Werburgh and Four Elms Hill, Chattenden). These are discussed further within Section 6.1 of Chapter 6: Noise and Vibration. Paragraph 6.1.16 lists the sensitive receptors that could be impacted by the Proposed Scheme.
- 12.1.22 Existing street lighting is present along the existing A289 and A228. No other significant sources of light pollution have been identified within the immediate vicinity.
- 12.1.23 There are potential sources of contamination within the footprint of the Proposed Scheme, which can include the highway itself (for instance, potential risks to human health can include oils, hydrocarbons, road run-off, and pollutants relating to air quality). Nearby sources of potential contamination include land used for military purposes (particularly considering potential for UXO), land where pollution incidents have occurred, made ground, dumped mixed waste, historic landfill sites, and the railway line within Phase 4. The potential sources of contamination are discussed within Section 14.1.

12.2. Potential Impacts of the Proposed Scheme

Construction Phase

- 12.2.1 Examining the Proposed Scheme, described in Chapter 2, together with the initial consideration of sensitive receptors identified within the Baseline Section of this chapter, we consider that the Proposed Scheme has the potential to result in the following impacts during the construction phase. We propose that these elements of assessment are scoped into the EIA:

Loss of Agricultural Land

- 12.2.2 It is anticipated that the Proposed Scheme could require the taking of some adjacent land to accommodate some of the works which include widening and the creation of junctions along the

roads situated within the Proposed Scheme boundaries. In particular, for the creation of the relief road within Phase 2, current derelict and agricultural land will be lost.

Impacts on Private assets

- 12.2.3 It is anticipated that construction of the Proposed Scheme could result in temporary adverse impacts upon private such as businesses, community facilities (including public open space) from reduced access and travel delays.

Community Severance

- 12.2.4 Community severance is defined as the potential severance or disruption to access to residences, community facilities and development land during and after construction as a result of construction related works. Bus routes in the area include routes along Hoo Road, Four Elms Hill, Upchat Road, Chattenden Lane, Main Road Hoo, Peninsula Way, Ratcliffe Highway and Bells Lane. During construction, there is the potential for works to temporarily disrupt these services or cause diversions of the route which could temporarily isolate communities and individuals, particularly those living outside of Wainscott, Chattenden and Hoo St Werburgh.

Changes in driver stress and delay

- 12.2.5 It is anticipated that temporary road blockages and diversions would be required during the construction of the Proposed Scheme. It is anticipated that these diversions could, temporarily, increase driver stress delay and stress for vehicle receptors. Therefore, potential effects on driver stress during construction will be assessed within the ES.

Impacts on Non-Motorised Users

- 12.2.6 It is anticipated that the Proposed Scheme will cause temporary disruption and change in accessibility for public routes, including footpaths, bridleways and cycleways. Changes in accessibility and amenity value of public routes and recreational resources will be considered within the ES.

Human Health

- 12.2.7 The potential for disturbance, disruption, reduction in amenity and impacts to human health of residents during construction will be considered in in relation Chapters assessing Acoustics, Air Quality and Townscape and Visual, as appropriate. These will be cross referenced where appropriate.

Operation and Maintenance

- 12.2.8 We consider that the Proposed Scheme has the potential to result in the following impacts during the Operation and Maintenance. We propose that these elements of assessment are scoped into the EIA:

Changes in driver stress and delay

- 12.2.9 During operation, the Proposed Scheme is anticipated to provide a positive effect on driver stress and delay as the Proposed Scheme aims to improve journey times and reliability. As the purpose of the Proposed Scheme is partly to prepare for future residential development in the area, it offers positive impacts regarding future capacity of the involved roads. As such, the potential effects of the Proposed Scheme on driver stress and delay during operation will be considered further within the ES.

Changes in Accessibility for Non-Motorised Users:

- 12.2.10 It is anticipated that the Proposed Scheme will enhance connectivity for NMUs, through the anticipated incorporation of enhanced cycle and footway links. There are also proposed new crossing points for soldiers within Phase 1. Therefore, changes in accessibility and amenity value of public routes and recreational resources will be considered within the ES.

Health Impacts

- 12.2.11 The proposed scheme has the potential to result in health impacts including the following:

- Effects in relation to quality of surroundings and sense of place
- changes in noise and vibration;
- effects upon Air Quality;
- effects upon Water Environment;
- contamination; and
- changes in lighting

12.3. Impacts to be Scoped Out

- 12.3.1 Whilst limited elements of the construction phase will require the employment of specialist contractors, it is assumed that the majority of the construction workforce will be from the region (the South East) and the resources and skills necessary to construct the Proposed Scheme are available. Given the large majority of workers will reside close to the site it is anticipated that a high proportion of construction workers will continue to reside within their current locations. Therefore, there is unlikely to be a significant increase in workers moving into the local area and associated increased demand for local services (e.g. education, healthcare or community facilities) or on recreational / open space. Therefore, this will not be considered further within the ES.
- 12.3.2 Given the nature of the Proposed Scheme (i.e. highways infrastructure), there are unlikely to be any significant changes to demands for local services, accommodation and recreational open space during the operation phase. Therefore, this will not be considered further within the ES.

- 12.3.3 Site security arrangements for the Proposed Scheme will be provided in accordance with the requirements of the Construction (Design and Management) Regulations 2015 and appropriate security (CCTV / security personnel) will be provided on-site. Therefore, effects in relation to crime and perception of crime will not be considered further within the ES.
- 12.3.4 Once operational, the Proposed Scheme will not involve changes further in land use, in terms of demolition or refurbishment. Therefore, changes in private and public landholdings during the operational will not be considered in the ES.

12.4. Proposed Assessment Methodology

Land Use and Accessibility

- 12.4.1 A more detailed desktop review will be undertaken in order to build on the baseline section of this Chapter. The review will cover the following sources:
- Office of National Census data;
 - NOMIS
 - Indices of Multiple Deprivation;
 - MAGIC; and
 - OS maps.
- 12.4.2 The assessment for this will be undertaken in accordance with the principles set out in the DMRB Guidance LA 112 and will focus on the potential for the scheme to significantly effect:
- private property and housing;
 - community land and assets;
 - development land and businesses;
 - agricultural land holdings;
 - drivers; and
 - walkers, cyclists and horse riders.

Study Area

- 12.4.3 The study area shall be based on the construction footprint/project boundary (including compounds and temporary land take) plus a 500m area surrounding the project boundary. Where likely effects are identified outside the 500m area surrounding the project boundary, In line with guidance DMRB Guidance document LA112, this study area will be extended or reduced accordingly to correspond with the extent of likely effect arising from the scheme.

Baseline Data Collection

- 12.4.4 A more detailed desktop review will be undertaken in order to build upon the baseline information presented in the Chapter. In line with DMRB Guidance LA112, this will include:

- private property and housing:
 - the location and number of properties at risk of demolition, or from which land will be required/access affected by a project; and
 - the location of residential development land and number of units that will be affected by a project.
- Community land and assets:
 - the location of community land (e.g. common land, village greens, open green space, allotments, sports pitches etc) and amount of land which will be required/access affected by a project;
 - the location of community assets (e.g. village halls, healthcare facilities, education facilities, religious facilities etc) and number of assets from which land will be required/access affected by a project;
 - the level of existing accessibility restrictions/severance to community land and assets within the study area; and
 - the frequency of use of community land and assets within the study area.
- Development land and businesses:
 - the location and number of businesses (and associated jobs) at risk or from which land will be required/access affected by a project;
 - the location of land allocated for development by local authorities and the number of future jobs that will be affected by a project;
 - land not allocated by local authorities which is subject to planning application(s) supporting future jobs; and d) the level of existing accessibility restrictions/severance to development land and businesses within the study area.
- Agricultural land holdings:
 - the type, location and number of agricultural holdings at risk of demolition or from which land will be required/access affected by a project;
 - the level of existing severance/accessibility restrictions to agricultural land holdings within the study area; and

- the frequency of use of the agricultural holdings/assets within the study area.
- Walkers, cyclists and horse riders.
 - the type, location and extent of WCH provision (e.g. public rights of way) within the study area; and
 - the frequency of use of the WCH provision within the study area.

12.4.5 The review will include the following data sources:

- Office of National Census data;
- Office of National Statistics NOMUIS official labour market statistics
- Indices of Multiple Deprivation
- Medway Council data
- Defra Multi Agency Geographic Information for the Countryside (MAGIC)
- Ordnance Survey Mapping

12.4.6 Where appropriate information from other studies may also be referenced to gain a better understanding of the baseline conditions, including the existing amenity value of the site.

12.4.7 A site visit will also be undertaken to gain a better understanding of the baseline conditions, in particular the existing amenity value of the Application Site.

12.4.8 A site visit will also be undertaken to gain a better understanding of the baseline conditions, in particular the existing amenity value of the Application Site.

Consultation

12.4.9 Consultation will be undertaken with the relevant officers at Medway Council and Gravesham Council to discuss the detailed scope and methodology for the assessment of the Proposed Scheme. Where appropriate, local businesses, community organisations and recreational organisations will also be consulted to gain a greater understanding of the baseline conditions and the approach and methodology for the assessment.

Significance Criteria

12.4.10 It is proposed that the assessment of significance is undertaken in line with the criteria published in DMRB Guidance LA 112, which sets out descriptors for assessing (i) the value (sensitivity) or a receptor and (ii) the magnitude of impact. These descriptors are reproduced in Table 44 and Table 45 respectively.

12.4.11 The significance of effect shall be derived by combining the assigned value (sensitivity) of receptors with the magnitude of change arising from a project. The assessment of significance will be undertaken in accordance with the overarching approach presented in Chapter 4 and the criteria set out in Section 4.3.

Table 44: Receptor value (sensitivity) descriptors for Land Use and Accessibility assessments

(reproduction of Table 3.11 published in DMRB guidance document LA112)

Value (sensitivity)	Description
Very Large	<p>Private property and housing:</p> <p>existing private property or land allocated for housing located in a local authority area where the number of households are expected to increase by >25% by 2041 (ONS data); and/or</p> <p>existing housing and land allocated for housing (e.g. strategic housing sites) covering >5ha and / or >150 houses.</p> <p>Community land and assets where there is a combination of the following:</p> <p>complete severance between communities and their land/assets, with little/no accessibility provision;</p> <p>alternatives are only available outside the local planning authority area;</p> <p>the level of use is very frequent (daily); and</p> <p>the land and assets are used by the majority ($\geq 50\%$) of the community.</p> <p>Development land and businesses:</p> <p>existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >5ha.</p> <p>Agricultural land holdings:</p> <p>areas of land in which the enterprise is wholly reliant on the spatial relationship of land to key agricultural infrastructure; and</p> <p>access between land and key agricultural infrastructure is required on a frequent basis (daily).</p> <p>Walkers, Cyclists and Horse riders (WCH):</p> <p>national trails and routes likely to be used for both commuting and recreation that record frequent (daily) use. Such routes connect communities with employment land uses and other services with a direct and convenient WCH route. Little / no potential for substitution.</p> <p>routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who could be disproportionately affected by small changes in the baseline due to potentially different needs.</p> <p>rights of way for WCH crossing roads at grade with >16,000 vehicles per day.</p>
High	<p>Private property and housing:</p> <p>private property or land allocated for housing located in a local planning authority area where the number of households are expected to increase by 16-25% by 2041 (ONS data); and/or</p> <p>existing housing and land allocated for housing (e.g. strategic housing sites) covering >1-5ha and / or >30-150 houses.</p> <p>Community land and assets where there is a combination of the following:</p> <p>there is substantial severance between community and assets, with limited accessibility provision;</p> <p>alternative facilities are only available in the wider local planning authority area;</p> <p>the level of use is frequent (weekly); and</p> <p>the land and assets are used by the majority ($\geq 50\%$) of the community.</p> <p>Development land and businesses:</p>

Value (sensitivity)	Description
	<p>existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering >1 - 5ha.</p> <p>Agricultural land holdings:</p> <p>areas of land in which the enterprise is dependent on the spatial relationship of land to key agricultural infrastructure; and</p> <p>access between land and key agricultural infrastructure is required on a frequent basis (weekly).</p> <p>WCH:</p> <p>regional trails and routes (e.g. promoted circular walks) likely to be used for recreation and to a lesser extent commuting, that record frequent (daily) use. Limited potential for substitution; and/or</p> <p>rights of way for WCH crossing roads at grade with >8,000 - 16,000 vehicles per day.</p>
Medium	<p>Private property and housing:</p> <p>houses or land allocated for housing located in a local authority area where the number of households are expected to increase by >6-15% by 2041 (ONS data); and/or</p> <p>existing housing and land allocated for housing (e.g. strategic housing sites) covering <1ha and/or <30 houses.</p> <p>Community land and assets where there is a combination of the following:</p> <p>there is severance between communities and their land/assets but with existing accessibility provision;</p> <p>limited alternative facilities are available at a local level within adjacent communities;</p> <p>the level of use is reasonably frequent (monthly); and</p> <p>the land and assets are used by the majority ($\geq 50\%$) of the community.</p> <p>Development land and businesses:</p> <p>existing employment sites (excluding agriculture) and land allocated for employment (e.g. strategic employment sites) covering <1ha.</p> <p>Agricultural land holdings:</p> <p>areas of land in which the enterprise is partially dependent on the spatial relationship of land to key agricultural infrastructure; and</p> <p>access between land and key agricultural infrastructure is required on a reasonably frequent basis (monthly).</p> <p>WCH:</p> <p>public rights of way and other routes close to communities which are used for recreational purposes (e.g. dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys, and / or</p> <p>rights of way for WCH crossing roads at grade with >4000 - 8000 vehicles per day.</p>

Value (sensitivity)	Description
Low	<p>Private property and housing: proposed development on unallocated sites providing housing with planning permission/in the planning process.</p> <p>Community land and assets where there is a combination of the following: limited existing severance between community and assets, with existing full Disability Discrimination Act (DDA) DDA 1995 compliant accessibility provision; alternative facilities are available at a local level within the wider community; the level of use is infrequent (monthly or less frequent); and the land and assets are used by the minority ($\geq 50\%$) of the community.</p> <p>Development land and businesses: proposed development on unallocated sites providing employment with planning permission/in the planning process.</p> <p>Agricultural land holdings: areas of land which the enterprise is not dependent on the spatial relationship of land to key agricultural infrastructure; and access between land and key agricultural infrastructure is required on an infrequent basis (monthly or less frequent).</p> <p>WCH: routes which have fallen into disuse through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes, and/or rights of way for WCH crossing roads at grade with < 4000 vehicles per day.</p>
Negligible	<p>Private property and housing: N/A.</p> <p>Community land and assets where there is a combination of the following: no or limited severance or accessibility issues; alternative facilities are available within the same community; the level of use is very infrequent (a few occasions yearly); and the land and assets are used by the minority ($\geq 50\%$) of the community.</p> <p>Development land and businesses: N/A.</p> <p>Agricultural land holdings: areas of land which are infrequently used on a non-commercial basis.</p> <p><u>WCH</u>: N/A.</p>

Table 45: Impact magnitude descriptors for Land Use and Accessibility assessments

(reproduction of Table 3.11 published in DMRB guidance document LA112)

Magnitude of impact	Typical description
Major	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. e.g. direct acquisition and demolition of buildings and direct development of land to accommodate highway assets; and/or</p> <p>introduction (adverse) or removal (beneficial) of complete severance with no/full accessibility provision.</p> <p>WCH: >500m increase (adverse) / decrease (beneficial) in WCH journey length.</p>
Moderate	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>1) partial loss of/damage to key characteristics, features or elements, e.g. partial removal or substantial amendment to access or acquisition of land compromising viability of property, businesses, community assets or agricultural holdings; and/or</p> <p>2) introduction (adverse) or removal (beneficial) of severe severance with limited / moderate accessibility provision.</p> <p>WCH: >250m - 500m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
Minor	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>1) a discernible change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements, e.g., amendment to access or acquisition of land resulting in changes to operating conditions that do not compromise overall viability of property, businesses, community assets or agricultural holdings; and/or</p> <p>2) introduction (adverse) or removal (beneficial) of severance with adequate accessibility provision.</p> <p>WCH: >50m - 250m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
Negligible	<p>Private property and housing, community land and assets, development land and businesses and agricultural land holdings:</p> <p>1) very minor loss or detrimental alteration to one or more characteristics, features or elements. e.g. acquisition of non-operational land or buildings not directly affecting the viability of property, businesses, community assets or agricultural holdings; and/or</p> <p>2) very minor introduction (adverse) or removal (beneficial) of severance with ample accessibility provision.</p> <p>WCH: <50m increase (adverse) or decrease (beneficial) in WCH journey length.</p>
No change	No loss or alteration of characteristics, features, elements or accessibility; no observable impact in either direction.

Assessment of Human Health

12.4.12 The assessment for the will be undertaken with reference to the principles set out in the DMRB Guidance LA112 and will focus on the potential for the Proposed Scheme to significantly effect:

Study area

12.4.13 In line within the criteria set out in DMRB Guidance LA112, the study area shall be defined based on the following:

- the extent and characteristics of a project, and
- the communities/wards directly and indirectly affected by the project.

Consultation

12.4.14 Consultation will be undertaken with the relevant officers at Medway Council and Gravesham Council to discuss the detailed scope and methodology for the assessment of the Proposed Scheme.

Baseline scenario

12.4.15 The process for developing the health baseline shall build upon the baseline information collated for this scoping report with an aim to further identify health determinants likely to be affected by a project, including:

- environmental conditions relevant to human health. This will draw information from other topic chapters and will include:
 - ambient air quality and Air Quality Management Areas (AQMA);
 - ambient noise and areas sensitive to noise (e.g. noise important areas (NIA), noise management areas (NMA));
 - sources of pollution (e.g. light, odour, contamination etc);
 - landscape amenity; and:
- severance/accessibility and the ability of communities to access community land, assets and employment.

12.4.16 In line within the criteria set out in DMRB Guidance LA112, the baseline health profiles of the communities within the study area shall be established, including the following data;

- percentage of community with increased susceptibility to health issues (vulnerable members, e.g. 65);
- percentage of community with pre-existing health issues (e.g. respiratory disease/chronic obstructive pulmonary disease (COPD));
- deaths from respiratory diseases;
- percentage of community with long term illness or disability;
- general health;
- life expectancy; and

- income deprivation.

12.4.17 The following indicative types of health determinants shall be identified to inform the baseline scenario, building on the baseline set out in relevant topic chapters:

- the location and type of community, recreational and education facilities and severance/separation of communities from such facilities;
- the location of green/open space and severance/separation of communities from such facilities;
- the location of healthcare facilities and severance/separation of communities from such facilities;
- outline spatial characteristics of the transport network and usage in the area, including the surrounding road network, Public Rights of Way (including bridleways), cycle ways, non-designated public routes and public transport routes;
- air quality management areas and ambient air quality;
- areas recognised as being sensitive to noise (e.g. noise important areas, noise management areas) and the ambient noise environment;
- sources and pathways of potential pollution (e.g. land/water contamination);
- landscape amenity;
- safety information associated with the existing affected road network (e.g. numbers of killed and seriously injured); and
- where available, information collated from stakeholder consultation.

12.4.18 Information collated to inform the land use and accessibility assessment will be used to inform the changes in accessibility/severance to communities in the context of human health.

Assessment criteria - human health

12.4.19 A qualitative assessment of human health shall be undertaken. Where applicable, this will evidence the findings and conclusions of other topic chapters including Air Quality, Noise and Vibration, Geology and Soils and Landscape and Visual. It is expected that this chapter will cross reference the following:

- Effects in relation to quality of surroundings and sense of place will be considered, where appropriate as assessed within the Cultural Heritage Chapter and Townscape and Visual Chapter.
- Effects in relation to health will be considered, as appropriate, as assessed within chapters covering Acoustics, Air Quality, Water Environment and Geology and Soils.

- It is anticipated that the Proposed Scheme will alter the street lighting along the length of the scheme. The lighting design has not yet been finalised. The potential health impacts will be considered within the Population and Health Chapter.

12.4.20 It is noted in within DMRB Guidance LA112 that, although the assessment of human health effects describes the likely qualitative health outcomes, it is not possible to quantify the severity or extent of the effects which give rise to these outcomes; and that

12.4.21 In line with the guidance presented in LA112, the plausibility of a project generating an impact on the health of individuals and communities will be evidenced using a source-pathway-receptor model, as presented in the IEMA health in EIA, 'Health in Environmental Impact Assessment: A primer for a proportionate approach'.

12.4.22 Changes to health determinants as a result of a project shall be identified.

12.4.23 Once the health profile of communities has been established, the sensitivity of a community/population to change shall be identified (supported with evidence) and reported as low, medium or high.

12.4.24 Once community/population sensitivity and changes to health determinants likely to occur as a result of a project have been established, the likely health outcome(s) shall be identified in line with the categories in presented below, with evidence provided to support conclusions.

- Positive – A beneficial health impact is identified
- Neutral – No discernible health impact is identified
- Negative – An adverse health impact is identified
- Uncertain – Where uncertainty exists as to the overall health impact

12.5. Assumptions and Limitations

12.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.

12.5.2 The required construction footprint for the Proposed Scheme is yet to be determined. It is anticipated that this to be refined within the ES.

12.6. References

- Gov.uk English indices of deprivation 2019 data tables
<https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019>
- Highways England 2020 Sustainability & Environment Appraisal (LA 112): Population and Health (Revision 1 January 2020) ((formerly DMRB Volume 11, Section 3, Part 6 (Land),

Volume 11, Section 3, Part 8 (Pedestrians, Cyclists, Equestrians and Community Effects) and Volume 11, Section 3, Part 9 (Vehicle Travellers))

- Kent County Council Public Rights of Way map
<https://webapps.kent.gov.uk/countrysideaccesscams/standardmap.aspx>
- Natural England (2010) Agricultural Land Classification London and the South East (ALC007)
<http://publications.naturalengland.org.uk/publication/141047?category=5954148537204736>
- Office of National Statistics (2019) NOMIS Official Labour Market Statistics
- Sustrans National Cycle Network <https://www.sustrans.org.uk/national-cycle-network>
- Institute of Environmental Management and Assessment (2017) *IEMA health in EIA, 'Health in Environmental Impact Assessment: A primer for a proportionate approach'*.

13. Material Assets and Waste

13.1. Scoping Baseline

- 13.1.1 The primary study area used to assess and determine the baseline comprises the Proposed Scheme footprint, as shown in the Environmental Constraints Plans presented in Appendix A.
- 13.1.2 A secondary study area has also been applied and this relates to the availability of construction and recovered material resources within the South East region and the UK.

Material Resources

Materials Currently Required:

- 13.1.3 The operation and maintenance of the current infrastructure assets within the Proposed Scheme boundary are likely to require a small number or volume of specialist components (such as light bulbs, signage steelwork and kerbstones), as well as some bulk products for routine repairs (such as asphalt for minor re-surfacing).
- 13.1.4 The current consumption of such materials for the existing A289, A228, associated junctions and other roads associated with the scheme is considered to be negligible.
- 13.1.5 The do-minimum option (no scheme pursued) is not expected to alter the current consumption of material resources within the Proposed Scheme footprint.

Availability of Construction Materials

- 13.1.6 Table 46, below, provides a summary of the availability of the main construction materials in the South East region and within the UK. The overview provides context for the assessment of impacts and significant effects relating to the material consumption for the Proposed Scheme.

Table 46: Published figures for construction materials

Material		Published Figures	
		South East	UK
Aggregate	Sand and Gravel (2019 data)	16,584Mt *	58,493Mt *
	Crushed Rock (2017 data)	0.1Mt ◇	114Mt (GB data) ◇
Recycled and secondary aggregate (as part of 'Aggregate', above) (2017 data)		(no data available)	74Mt ◇
Ready-mix concrete (2019 data)		2.5Mm ³ ◇	16.4Mm ³ *
Concrete Blocks (2019 data)		(no data available)	9.14 Mm ³ **
Steel (2016 data)		(no data available)	8Mt #
Asphalt (2017 data)		1.6Mt ◇	27.3Mt ◇
* 2019 data relating to the Sale of this product, published in the Monthly Statistics of Building Materials and Components June 2020			

Material	Published Figures	
	South East	UK
**	2019 data relating to available stocks of this product, published in the Monthly Statistics of Building Materials and Components June 2020	
◇	2017 data relating to sales as published in the Mineral Products Association Profile of the UK Mineral Products Industry 2018 Edition	
#	2016 data relating to the UK production of this product as published in the UK steel industry: statistics and policy Number 07317, 2 January 2018	

- 13.1.7 The availability of all construction materials in the UK indicates that stocks, production and sales remain buoyant. Using UK data as a proxy, in combination with information that is available for the South East region, the sensitivity of material availability for the Proposed Scheme is considered to be low. The only material which may be less available within the region is crushed rock.

Site Arisings

Existing Arisings:

- 13.1.8 Current routine operation and maintenance works on existing infrastructure assets within the Proposed Scheme boundary (carriageway and junctions) are likely to generate negligible volumes of site arisings.
- 13.1.9 The do-minimum option (no scheme pursued) is not expected to change to volume or type of site waste arisings generated.

Transfer, Recovery and Recycling:

- 13.1.10 The UK statistic on waste (last updated in March 2020), published by Defra, presents figures compiled on the total waste generated for the whole of the UK. This data shows that within England, the recovery rate for non-hazardous construction and demolition arisings has remained above 90% since 2010. This exceeds the European Union target of 70% by 2020. This data is reproduced in Table 47.

Table 47: Recovery rate from non-hazardous construction and demolition waste for England, 2010-16

Year	Generation (Mt)	Recovery (Mt)	Recovery Rate (%)
2010	53.6	49.4	92.2 %
2011	54.9	50.8	92.5 %
2012	50.5	46.4	92.0 %
2013	51.7	47.6	92.0 %
2014	55.9	51.7	92.4 %
2015	57.7	53.3	92.3 %
2016	59.6	55.0	92.1 %

- 13.1.11 The availability of materials recovery across England, suggests that there is strong potential to divert from landfill site arisings generated by the Proposed Scheme. Both the importance

(positive value) of this infrastructure indicates there is strong potential to maximise the reuse and recycling value of site arisings. This has the potential to materially influence the assessment of materials and waste.

Waste Generation and Disposal

Waste Generated and Disposal:

- 13.1.12 The operation and maintenance of the existing infrastructural assets is likely to generate small volumes of waste from routine highway maintenance, in combination with littering, light replacement, signage replacement, and replacement of reflective road studs (cats' eyes). The anticipated effects of disposing of this waste are deemed negligible in the context of available regional capacity.

Regional Perspective: Remaining Landfill Capacity:

- 13.1.13 Data published by the Environment Agency at the end of 2018 details the remaining landfill capacity for the South East region. This data, summarised in Table 48 below, shows that at the end of 2018 the South East region had 64 active landfill sites with 73.13 Mm³ of remaining capacity.

Table 48: Remaining landfill capacity for the South East region

Landfill Type	Number of Sites listed in EA data set	Number of Sites with capacity	Remaining Capacity end 2018 (m ³)
Inert	70	46	29,067,634
Non-Hazardous	25	8	15,138,635
Non-Hazardous with Stable Non-Reactive Hazardous Waste Cell	10	8	28,694,648
Hazardous Merchant Landfill	1	1	215,137
Hazardous Restricted Landfill	2	1	13,345
Total remaining Capacity		73,129,399	

- 13.1.14 Considering the landfill capacity within the region, the existing waste infrastructure is likely to have sufficient capacity to accommodate waste from the project, without compromising the integrity of the receiving infrastructure (design life or capacity) within the region.

13.2. Potential Impacts of the Proposed Scheme

Construction Phase

- 13.2.1 Examining the Proposed Scheme, described in Chapter 2, together with the sensitive receptors identified within the Baseline Section of this chapter, we consider that the Proposed Scheme

has the potential to result in the following impacts during the construction phase. We propose that these elements of assessment are scoped into the EIA:

Demolition - Production and Disposal of Waste:

- 13.2.2 Demolition works associated within the scheme are likely to generate waste including broken out concrete, brick, mortar steel and road surface planings, hazardous or contaminated material found on or beneath the Proposed Scheme.
- 13.2.3 It would be expected that arisings from demolition would be reused and / or recycled on or off site, with beneficial effect. Where diverting site arisings from landfill is not possible, the impacts associated with disposing of waste would be adverse, permanent and direct.
- 13.2.4 The potential for significant effects from waste disposal is associated with the commensurate reduction in landfill capacity, and any indirect effects that result (greenhouse gas emissions, water consumption, water pollution etc.). Landfill capacity is increasingly becoming a sensitive receptor in the UK. Where demolition waste needs to be disposed of, and in combination with other the on-site phases, there is potential for significant adverse effects.

Site Remediation and Preparation - Use of Material Resources:

- 13.2.5 Timber and steel products will be required for the erection of perimeter fencing and temporary barriers as part of the site preparation phase. Temporary stockpile and construction areas may also be required and could necessitate the consumption of aggregate and stone for ground improvements prior to use by heavy plant and equipment.
- 13.2.6 Impacts associated with material resource consumption at this stage are likely to be adverse, permanent and direct. In combination with other lifecycle stages (particularly construction of the Proposed Scheme), there is potential to generate significant adverse effects from material resource consumption during site remediation and preparation.

Site Remediation and Preparation – Production and Disposal of Waste:

- 13.2.7 Wastes likely to be generated during site preparation include:
- Vegetation and other above ground materials produced by site clearance;
 - Paving, kerbing, bitumen and sub-base material;
 - Surplus non-highway subsoil material; and
 - Hazardous or contaminated material found on or beneath the Proposed Scheme.
- 13.2.8 The presence or extent of any hazardous or contaminated substances is currently unconfirmed. The disposal such material has the potential to result in significant adverse effects.
- 13.2.9 There is potential for considerable waste to be produced and disposed of during site preparation works; associated impacts would be adverse, permanent and direct. Some impacts could be precluded where arisings e.g. subsoil and kerbing, can be diverted from landfill. However, where waste from site remediation and preparation does need to be disposed of, there is potential for significant adverse effects.

Proposed Scheme Construction - Use of Material Resources:

13.2.10 Material resources will be required for the proposed road widening and junction improvements. Construction materials required are anticipated to include:

- Bulk materials for earthworks (volumes will be dependent on the cut and fill balance);
- Road and pedestrian paving and kerbing materials, including sub-base and bituminous materials;
- Concrete including for pre-cast and prefabricated elements, especially for the new embankments, retaining walls and bridge structure;
- Bricks, sand and aggregate;
- Timber and steel for fencing and formwork;
- New street furniture, signage and lighting;
- Cabling; and
- Other general construction materials.

13.2.11 The volumes of material resources required for the Proposed Scheme will be ascertained during the Environmental Impact Assessment. Volumes of bulk earthworks, road paving, steel, concrete and aggregate are expected to be significant.

13.2.12 The main impacts as a result of the use of materials are the consumption of natural resources. Impacts would be considered adverse, direct and permanent, and could result in the following effects:

- Depletion of natural resources and local / regional stocks; and
- Degradation of the natural environment.

13.2.13 Based on the scale and nature of the works it is anticipated that the consumption of material resources has the potential to have significant adverse effects.

Proposed Scheme Construction - Production and Disposal of Waste:

13.2.14 Waste is anticipated to be generated during the construction of the Proposed Scheme. It is anticipated that the following wastes would be generated:

- Timber and steel from formwork and fencing;
- Concrete, bricks, aggregate and steel waste;
- Road paving materials including sub-base and bituminous materials;
- Hazardous or contaminated material found or generated on site;
- Surplus cabling;

- Redundant street furniture, signage and lighting; and
- General construction waste e.g. packaging, ducting, damaged goods.

13.2.15 The volumes of waste likely to be generated and disposed of as result of the Proposed Scheme will be identified and assessed during the Environmental Impact Assessment.

13.2.16 Impacts as a result of waste generation would be adverse and direct and are generally accepted to be permanent in nature. The resultant adverse effects would be a reduction in landfill void capacity, and any indirect effects that result (greenhouse gas emissions, water consumption, water pollution – among others).

13.2.17 It is expected that a programme commitment to reuse or recycle site arisings will be established, making use of these resources either within, or outside, the Proposed Scheme boundary. Where this is not possible, disposal is likely to be required.

13.2.18 Based on the scale and nature of the works, it is anticipated that there is potential for significance adverse effects from the generation and disposal of waste.

Operation

13.2.19 In the first year of operation, minor amendments and changes to the Proposed Scheme assets may be required. Depending on the extent of these changes, the potential to consume material resources (including recovered site arisings) and produce and dispose of waste may be required. The extent of changes within the first year of operation is not currently known, but professional judgement would indicate that there are unlikely to be significant effects. Nevertheless, where these changes can be forecast for the first year of operation, they will be included in the Environmental Impact Assessment.

13.3. Impacts to be Scoped Out

13.3.1 The Proposed Scheme is unlikely to result impact upon the following. It is proposed that these elements are scoped out of the EIA:

Consumption of material resources during demolition:

13.3.2 The consumption of materials during demolition is likely to be low. The potential for significant adverse effects is considered to be negligible.

Consumption of materials and the production and disposal of waste beyond the first year of operation:

13.3.3 It is predicted that material consumption and the production and disposal of waste beyond the first year of operation are unlikely to give rise to significant effects. It is therefore proposed that this element scoped out of the EIA.

13.4. Proposed Assessment Methodology

- 13.4.1 The primary guidance that will be used to inform the assessment process is the Institute of Environmental Management and Assessment (IEMA) guide to: Materials and Waste in Environmental Impact Assessment, as well as the DMRB LA 110 Material assets and waste guidance.
- 13.4.2 As the proposed works comprise demolition works, highway alterations and widening and associated infrastructure, the Proposed Scheme is classed as a 'large local major scheme'. In accordance with UK EIA Regulations, as well as other relevant regulations (as detailed within the IEMA Materials and Waste in EIA guidance document), there is a requirement for the identification, description and assessment of the use of natural resources, and the production of waste to be carried out within the EIA. Therefore, a detailed assessment of material resources and waste shall be undertaken.
- 13.4.3 As stated within Section 13.3.3, the consumption of materials and the production and disposal of waste beyond the first year of Proposed Scheme operation, has been scoped out because forecasts anticipate negligible impacts and effects.
- 13.4.4 As part of the Environmental Impact Assessment, the following tasks will be carried out:
- Relevant waste legislation, policies and guidance will be reviewed to identify material use and waste management objectives, commitments and targets;
 - The likely types of material resources (including site arisings) and waste will be identified, and quantities estimated for the Proposed Scheme; for waste, inert and non-inert forecasts will be made;
 - Impacts will be evaluated against the regional and national materials markets and the capacity of regional (or, if appropriate, national) waste infrastructure;
 - Opportunities to eliminated, reduce, re-use, recycle or recover material resources, site arisings and (potential) waste, will be identified through a review of the Proposed Scheme (including proposed building materials, construction methods and design, where available) and in accordance with industry best practice; and
 - Identification of viable circular economy opportunities in design and construction will be made.
- 13.4.5 The ES will take into account the nature of impacts (adverse/ beneficial, permanent/ temporary, direct/ indirect) from material resources and waste. Significance of effects will be determined using a variety of tables taken from the IEMA Materials and Waste in EIA guidance document, whilst also taking into account the requirements of the national and local policy documents.
- 13.4.6 The main outputs from the detailed assessment will be:
- The identification of the environmental impacts and the significance of effects associated with material resources (including site arisings) and waste; and

- The measures which will be implemented to eliminate or mitigated impacts, and to fulfil resource efficiency and circular economy opportunities.

Assessment of Significance

- 13.4.7 Materials will be considered as a whole, whereas waste will be considered as inert & non-hazardous, and hazardous. There will be two methods of assessing magnitude for waste: void capacity and landfill diversion.
- 13.4.8 An assessment of both the sensitivity and magnitude of material and waste will be used, in order to assess the overall significance. This will be based upon the methods published in IEMA Materials and Waste in EIA guidance document.
- 13.4.9 The criteria for assessing sensitivity, for both materials and waste, are published in Section 10.2 of this IEMA guidance. This is reproduced in Table 49. The criteria for assessing magnitude are published in Section 10.3 of the IEMA Guidance. This is reproduced in Table 50.
- 13.4.10 The impacts significance to be applied will be consistent with the overarching approach presented in Section 4.3.

Table 49: Criteria for assessing the sensitivity of materials and waste (reproduced from guidance presented in Section 10.2 of IEMA Materials and Waste in EIA guidance document)

Sensitivity Category	Description
Very High	<p><u>Materials</u></p> <p>Are known to be insufficient in terms of production, supply and/ or stock; and/or</p> <p>Comprise no sustainable features and benefits compared to industry-standard materials.</p> <p><u>Inert and non-hazardous waste landfill void capacity</u></p> <p>Reduce very considerably (by >10%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.</p> <p><u>Hazardous waste landfill void capacity</u></p> <p>Reduce very considerably (by >1%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.</p>
High	<p><u>Materials</u></p> <p>Are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock; and/or</p> <p>Comprise little or no sustainable features and benefits compared to industry-standard materials.</p> <p><u>Inert and non-hazardous waste landfill void capacity</u></p> <p>Reduce considerably: by 6-10% as a result of wastes forecast.</p> <p><u>Hazardous waste landfill void capacity</u></p> <p>Reduce considerably: by 0.5-1% as a result of wastes forecast.</p>
Medium	<p><u>Materials</u></p>

Sensitivity Category	Description
	<p>Are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock; and/or</p> <p>Are available comprising some sustainable features and benefits compared to industry-standard materials.</p> <p><u>Inert and non-hazardous waste landfill void capacity</u></p> <p>Reduce noticeably: by 1-5% as a result of wastes forecast.</p> <p><u>Hazardous waste landfill void capacity</u></p> <p>Reduce noticeably: by 0.1-0.5% as a result of wastes forecast.</p>
Low	<p>Materials</p> <p>Are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock; and/ or</p> <p>Are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials.</p> <p><u>Inert and non-hazardous waste landfill void capacity</u></p> <p>Reduce minimally: by <1% as a result of wastes forecast.</p> <p><u>Hazardous waste landfill void capacity</u></p> <p>Reduce minimally: by <0.1% as a result of wastes forecast.</p>
Negligible	<p><u>Materials</u></p> <p>Are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock; and/or</p> <p>Are available comprising a very high proportion of sustainable features and benefit compared to industry-standard materials.</p> <p><u>Inert and non-hazardous waste landfill void capacity</u></p> <p>Remain unchanged or is expected to increase through a committed change in capacity.</p> <p><u>Hazardous waste landfill void capacity</u></p> <p>Remain unchanged or is expected to increase through a committed change in capacity.</p>

Table 50: Criteria for assessing impact magnitude for materials and waste (reproduced from guidance presented in Section 10.3 of IEMA Materials and Waste in EIA guidance document)

Magnitude Category	Description of Impact Magnitude
Major	<p>Materials</p> <p>One or more materials is >10% by volume of the regional baseline availability; and/or</p> <p>More than one allocated mineral site is substantially sterilised by the development rendering it inaccessible for future use.</p> <p>Inert and non-hazardous waste void capacity</p> <p>Waste generated by the development will reduce regional landfill void capacity baseline by >10%.</p> <p>Hazardous waste void capacity</p> <p>Waste generated by the development will reduce national landfill void capacity baseline by >1%.</p> <p>Landfill diversion</p> <p><30% landfill diversion.</p>
Moderate	<p>Materials</p> <p>One or more materials is between 6-10% by volume of the regional baseline availability; and/or</p> <p>One allocated mineral site is substantially sterilised by the development rendering it inaccessible for future use.</p> <p>Inert and non-hazardous waste void capacity</p> <p>Waste generated by the development will reduce regional landfill void capacity baseline by 6-10%.</p> <p>Hazardous waste void capacity</p> <p>Waste generated by the development will reduce national landfill void capacity baseline by <0.5-1%.</p> <p>Landfill diversion</p> <p>30-59% landfill diversion.</p>
Minor	<p>Materials</p> <p>One or more materials is between 1-5% by volume of the regional baseline availability; and/or</p> <p>The development has the potential to adversely and substantially impact access to one or more allocated mineral site (in their entirety), placing their future use at risk.</p> <p>Inert and non-hazardous waste void capacity</p> <p>Waste generated by the development will reduce regional landfill void capacity baseline by 1-5%.</p> <p>Hazardous waste void capacity</p> <p>Waste generated by the development will reduce national landfill void capacity baseline by <0.1-0.5%.</p> <p>Landfill diversion</p> <p>60-89% landfill diversion</p>

Magnitude Category	Description of Impact Magnitude
Negligible	<p>Materials</p> <p>No individual material type is equal to or greater than 1% by volume of the regional baseline availability.</p> <p>Inert and non-hazardous waste void capacity</p> <p>Waste generated by the development will reduce regional landfill void capacity baseline by <1%.</p> <p>Hazardous waste void capacity</p> <p>Waste generated by the development will reduce national landfill void capacity baseline by <0.1%.</p> <p>Landfill diversion</p> <p>90-99% landfill diversion.</p>
No Change	<p>Materials</p> <p>No material is required.</p> <p>Inert and non-hazardous waste void capacity</p> <p>Zero waste generation and disposal from the development.</p> <p>Hazardous waste void capacity</p> <p>Zero waste generation and disposal from development.</p> <p>Landfill diversion</p> <p>100% landfill diversion</p>

13.5. Assumptions and Limitations

- 13.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.
- 13.5.2 The required construction footprint for the Proposed Scheme is yet to be determined. It is anticipated that this is to be refined within the ES.

13.6. References

- Department for Business, Energy & Industrial Strategy *Monthly Statistics of Building Materials and Components* (June 2020) available at:
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/896086/20-cs7 - Construction Building Materials - Bulletin June 2020.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/896086/20-cs7_-_Construction_Building_Materials_-_Bulletin_June_2020.pdf)

- Department for Environment, Food and Rural Affairs *UK Statistics on Waste*
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/874265/UK_Statistics_on_Waste_statistical_notice_March_2020_accessible_FIN_AL_rev_v0.5.pdf
- Design Manual for Roads and Bridges LA 110: Material assets and waste guidance (Revision 0 August 2019) (formerly IAN 153/11)
- Environment Agency Remaining Landfill Capacity:
<https://data.gov.uk/dataset/237825cb-dc10-4c53-8446-1bcd35614c12/remaining-landfill-capacity>
- Environmental Management and Assessment Guide to: Materials and Waste in Environmental Impact Assessment (March 2020)
- Mineral Products Association *Profile of the UK Mineral Products Industry 2018 Edition* available at <https://mineralproducts.org/documents/Facts-at-a-Glance-2018.pdf>
- UK steel industry: *Statistics and Policy Number 07317*, 2 January, available at: <https://commonslibrary.parliament.uk/research-briefings/cbp-7317/>

14. Geology and Soils

14.1. Scoping Baseline

- 14.1.1 The proposed baseline presented in the following subsections is informed by the Geosphere Environmental Phase 1 – Desk Study and Preliminary Risk Assessment for Phase 1-4, Hoo Peninsula, Kent (report ref: 4496,DS/DESK/AT,TP/17-03-20/V1). For Phase 5/6, a 2016 Amey for Medway Council Cultural Heritage Assessment Four Elms Roundabout to Medway Tunnel report (report ref: CO04500055/CH Revision 1) was consulted.

Topography

- 14.1.2 According to 1m DTM LiDAR data, Phase 1 is located at fairly low elevations (beneath 30mAOD) which is likely due to the Proposed Scheme's proximity to the River Medway Estuary and the North Sea. However, whilst land to the north and south of Phase 2, 3 and 4 is also fairly flat and at low elevations, land immediately surrounding the latter 3 phases reaches higher elevations with a number of hills. For instance, Beacon Hill is located south of Phase 2. There are also nearby locations containing the word hill, such as Lodge Hill, and the western sections of the A228 (before becoming Peninsula Way) is called Four Elms Hill. These names are indicative of the presence of hills in the immediate vicinity of the latter 3 phases. The elevation of the A228 within Phase 2, 3 and 4 ranges from 30mAOD to 60mAOD. Phase 5/6 is situated at elevations between 6mAOD and 25mAOD, with eastern parts of Wulfere Way and Four Elms Roundabout having a ground elevation of below 10mAOD.
- 14.1.3 An unnamed watercourse crosses Phase 1 near where Islingham Farm Road and Woodfield Way join and here ground elevations appear to be lower than parts of the surrounding area at approximately 10mAOD. Other unnamed watercourses, such as near Sharnal Street and south of the A228 in the eastern part of Phase 2, have similar ground elevations to immediately surrounding land (approximately 20-30mAOD).

Geology

- 14.1.4 The Phase 1 – Desk Study and Preliminary Risk Assessment stated that geology records have been obtained from the British Geological Survey (BGS) digital mapping at a 1:50,000 scale. A summary is provided in the paragraphs below.
- 14.1.5 Regarding superficial deposits, whilst the majority of Phase 1 and 2 contain no superficial deposits, Head deposits were indicated to underlie the very northwest of phase 1, River Terrace Deposits were indicated towards the west of Phase 1 and Alluvium was recorded towards the centre of Phase 1 (where Islingham Farm Road joints Woodfield Way). Head deposits were also present to the east of Phase 2 and across Phase 3 and 4, although some localised River Terrace Deposits were also present in Phase 3. Alluvium was also recorded to the very east of Phase 4. Phase 5/6 is underlain by Alluvium (Clay, Silt, Sand and Peat), Head (Clay and Silt) and River Terrace Deposits 2 (Sand and Gravel).
- 14.1.6 Made Ground deposits have the potential to be present across the Proposed Scheme, where parts of the Site have been previously developed.

- 14.1.7 Regarding the underlying bedrock, the geological mapping indicated that Phase 2, 3 and 4 are underlain by London Clay Formation. Phase 1 is underlain by Lews Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation (undifferentiated), Thanet Formation, Lambeth Group, and London Clay Formation. Phase 5/6 is underlain by Thanet Formation (Sand, Silt and Clay), and Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated).

Aerial Photography

- 14.1.8 A consultation of Google satellite mapping suggests that land surrounding the highway associated with the Proposed Works is predominantly undeveloped land used for agricultural purposes interspersed with isolated farmsteads and some more urbanised areas. Land to the south of Phase 1 is predominantly residential within the village of Wainscott. Other more built-up areas include Chattenden (to the south of Phase 2) and Hoo St Werburgh (with residential housing immediately south of Phase 3). Phase 4 is mostly surrounded by fields, although the railway line crosses to the west of the area near Sharnal Street.
- 14.1.9 Aerial photographs within the Phase 1 – Desk Study and Preliminary Risk Assessment were published in 2000 and are largely similar to the present-day Google satellite imagery. A key difference being land to the south of Phase 1 in Wainscott where further residential development has occurred south of the Hasted Road since 2000. Further residential development has also occurred in Chattenden, to the south of Phase 2, since 2000. The 2000 aerial photography also shows buildings within the former Chattenden Barracks area still being present, whereas present-day imagery suggests the buildings have been demolished. In 2000, the golf course to the north of Phase 3 was still in use, whereas today it is no longer present (although evidence of the golf course, such as bunkers and greens, still exist). Land immediately south of Phase 3 has become more developed since 2000 too. Since 2000, part of the field to the north of Phase 3 has been developed as a motocross racing circuit and sports club. To the north of Phase 4, land used as agricultural fields in the 2000 aerial photography has now been developed as part of a large farm and associated business facility.

Geological Designations

- 14.1.10 No geological designations have been identified within, or in the immediate vicinity of, the Proposed Scheme.

Records of Mines and Mineral Deposits

- 14.1.11 The online Coal Authority interactive mapping was consulted. It shows that there are no historic mine entries within the Site or in the surrounding area. The Envirocheck Report shows that there are 24 mineral deposits within 2km of the Proposed Scheme with 1 mineral deposit site being located within 250m of the Site, 4 up to 500m away and 19 up to 2km away. Out of the 24 mineral deposits sites, 21 sites had deposits of chalk and 3 sites had deposits of common clay and shale.

Land Use History

- 14.1.12 The historical land use and development of each study area has been established from the historical Ordnance Survey plans (1:10,560, 1:10,000 and 1:2,500-scale) dating from between 1867 and 1996 obtained from Envirocheck and reproduced in the Phase 1 – Desk Study and Preliminary Risk Assessment for Phase 1-4, Hoo Peninsula, Kent (report ref: 4496,DS/DESK/AT,TP/17-03-20/V1).
- 14.1.13 The historical maps show that the Proposed Scheme was located in largely undeveloped land and orchards, with some isolated buildings nearby. In more recent years, there is evidence of improved road infrastructure onsite and in the surrounding area.
- 14.1.14 In the 1860s, Phase 1 land was predominantly composed of areas of trees, undeveloped land and orchards. It is not until the 1960s that Wainscott (to the south of western Phase 1) becomes more urbanised and developed and more isolated buildings crop up surrounding the Phase 1 area. The orchards situated along the majority of Phase 1 in earlier mapping appears to disappear after the 1964-1971 mapping. Eastern parts of Phase 1 are similar in that in the late 1800s, land was mostly undeveloped land mixed with isolated farmsteads and orchards. The orchards mostly disappear between the 1933 and 1961 mapping to become areas with some buildings. The Royal School of Military Engineering also is built by 1971. Between 1999 and 2006, the A289 Hasted Road was built.
- 14.1.15 Phase 2 was mostly composed of undeveloped land and areas of woodland prior to the 1900s. In 1896, the Chattenden Barracks first appear on the map. By 1961, some of the undeveloped land became developed on. Post 1968, the Chattenden Barracks became much more developed and spread over nearby land and areas of woodland became coppiced. Eastern parts of Phase 2 contained areas of orchard prior to 1896. Much of the land in this section of Phase 2 has remained undeveloped to this day and aerial photography from 2000 suggests it is used for agricultural purposes. The eastern edge of Phase 2 has gradually become more developed between 1933 and 1962 as residential houses were built in the Broad Street area.
- 14.1.16 In 1870, Phase 3 land was predominantly composed of undeveloped fields surrounded by areas of woodland, such as Deangate Wood, and scattered farmsteads. The present-day Bell's Lane and Peninsula Way can be observed in the early mapping but on a smaller scale than the present-day roads. By the 1970s, some of the surrounding area had become more developed with more buildings to the south and the development of the Lodge Hill military camp to the north.
- 14.1.17 In the 1870s, Phase 4 land was mostly composed of undeveloped fields with roads, such as the present-day Roper's Lane and Ratcliffe Highway, running through the land. The area of Sharnal Street was most developed with a few buildings and an orchard. The railway line can be viewed on maps from 1897-1898 and the Chattenden Naval Tramway can be viewed on maps post-1909 (although it was deemed disused/ dismantled by the 1970s). By the 1960s, land use is mostly similar to previous years, although more orchards are present to the south of Phase 4 and it is evident that High Halstow, to the north, has become more developed. By 1999, the orchards that were present to the south of Phase 4 are no longer present and Ratcliffe Highway became more developed with the presence of a roundabout. Pylons appeared in the fields nearby post -1970 and the residential area surrounding Bell's Lane also spread and developed further.

- 14.1.18 For Phase 5/6, 1: 10, 560 scale historical OS mapping within the 2016 Amey for Medway Council Cultural Heritage Assessment Four Elms Roundabout to Medway Tunnel (report ref: CO04500055/CH Revision 1) suggests that in 1871, the current road did not exist and undeveloped fields, potentially used for agriculture, were in its place. Some orchards and woodland were located just north of the current A289 Wulfere Way. By 1910 some housing north-east of the current Sans Pareil Roundabout had been developed. By 1929, the land use was mostly the same with many orchards in the surrounding landscape. By 1960, Wainscott (to the north and east of the phase) had become more developed with some buildings present. Although there are no maps to confirm when after the 1960s the residential housing estates within Wainscott (between the A289 Hasted Road and A289 Wulfere Way) were built, it is likely that the majority of the development occurred closer to present day.

Contaminated Land and Environmental Records

Phase 1:

- 14.1.19 The Phase 1 – Desk Study and Preliminary Risk Assessment states that the potential sources of contamination within Phase 1 of the Proposed Works include:
- Military land use, including UXO; and
 - Made Ground (embankments, developed land etc.).
- 14.1.20 One substantial pollution incident has been recorded within 250m of Phase 1. This incident occurred in 2005 and involved crude sewage. The impact to water was classified as Category 2 – Significant Incident and the impact to air was classified as Category 3 – Minor Incident. There was no impact to land.
- 14.1.21 Regarding pollution incidents to controlled waters, 3 incidents have been recorded onsite, 5 within 250m of the Site and 1 within 250m to 500m. Of the onsite incidents, all are classified as Category 3 – Minor Incident. Whilst the incidents that occurred in 1993 and 1995 related to crude sewage, the incident that occurred in 1998 related to surcharged sewage.
- 14.1.22 The 5 recorded incidents to controlled waters within 250m of the Site included a Category 3 – Minor Incident involving crude sewage in 1998, a Category 2 – Significant Incident involving Oils – Diesel (including agricultural) in 1994, 2 Category 3 incidents involving surcharged sewage in 1998 and a Category 3 miscellaneous – fire water/ foam incident in 1994.
- 14.1.23 Within 250m to 500m of the site, a Category 3 – Minor Incident involving crude sewage occurred in 1997.
- 14.1.24 A discharge consent for trade effluent discharge – site drainage into freshwater stream is recorded onsite. 2 discharge consents are recorded within 250m of the Site: a trade discharge – process water into land and a trade effluent discharge – site drainage into freshwater stream. 3 discharge consents are recorded within 250m to 500m of the Site: 2 trade discharge – process water into land (revoked) consents and a sewage discharge – final/ treated effluent into freshwater stream.

- 14.1.25 No landfills or licensed waste management facilities are located within 500m of Phase 1. However, an inert landfill can be found approximately 1km south.
- 14.1.26 The Envirocheck Report also notes that there are some areas of potentially infilled land (non-water) within 500m of Phase 1 which include unknown filled ground (pit, quarry etc.).
- 14.1.27 The majority of Phase 1 is located within the North Kent Nitrate Vulnerable Zone (NVZ). This is a groundwater NVZ.
- 14.1.28 The Envirocheck Report indicates that western parts of Phase 1 are located within a Radon Affected Area. But it is also noted that the Envirocheck Report indicates that no radon protective measures are necessary in the construction of new dwellings or extensions.

Phase 2:

- 14.1.29 The Phase 1 – Desk Study and Preliminary Risk Assessment states that the potential sources of contamination within Phase 2 of the Proposed Works include:
- Military land use, including UXO;
 - Made Ground (embankments, developed land etc.).
 - Roadways/ areas of parking;
 - Rough track formed of brick and granite;
 - Dumped mixed waste; and
 - Oil interceptor.
- 14.1.30 One substantial pollution incident has been recorded within 500m of Phase 2. This incident occurred in 2017 and involved contaminated construction and demolition, and material and waste. The impact to land was classified as Category 2 – Significant Incident. There was no impact to air or water.
- 14.1.31 Regarding pollution incidents to controlled waters, 1 incident has been recorded onsite, 4 within 250m of the Site and 1 within 250-500m. The onsite incident occurred in 1999 and involved contaminated water relating to firefighting run off. This was classified as a Category 3 – Minor Incident.
- 14.1.32 The 4 recorded incidents to controlled waters included a Category 3 – Minor Incident involving sewage coming from manhole by old oak trees in 1999, a Category 3 incident in 1993 involving other sewage, a Category 3 incident in 1999 involving organic chemicals: petroleum spirits and another organic chemicals: petroleum spirits incidents which does not have a date or category assignation.
- 14.1.33 Within 250m to 500m of the Application Site, a Category 3 – Minor Incident occurred in 1999 involving organic chemicals: other mineral and synthetic oils.

- 14.1.34 3 revoked sewage and trade combined – unspecified into freshwater stream discharge consents have been recorded onsite and a trade discharge – process water discharge consent has been recorded within 250m to 500m of the Site.
- 14.1.35 No landfills or licensed waste management facilities are located within 500m of Phase 2.
- 14.1.36 The Envirocheck Report also notes that there are some areas of potentially infilled land (non-water) within 675m to 915m of Phase 2 which include unknown filled ground (pit, quarry etc.).
- 14.1.37 The majority of Phase 2 is located within Tidal Medway Drain B Nitrate Vulnerable Zone. This is a surface water NVZ.

Phase 3:

- 14.1.38 The Phase 1 – Desk Study and Preliminary Risk Assessment states that the potential sources of contamination within Phase 3 of the Proposed Works include:
- Made Ground (embankments, developed land, large 20 to 30m mound);
 - Roadways/ areas of parking; and
 - Dumped mixed waste.
- 14.1.39 Regarding pollution incidents to controlled waters, 1 incident has been recorded within 250m of the Site and 1 recorded within 250m to 500m. The incident within 250m occurred in 1995 and is classified as a Category 3 – Minor Incident relating to unknown sewage. The incident within 250m to 500m occurred in 1992 and is classified as a Category 3 incident relating to oils – diesel (including agricultural).
- 14.1.40 Onsite of Phase 3, a sewage discharges – final/ treated effluent into freshwater stream (revoked) and a sewage discharges – final/ treated effluent into unnamed tributary of the River Medway have been recorded. A sewage discharges – final/ treated effluent into freshwater stream (revoked) discharge consent has been recorded within 250m to 500m of the Site.
- 14.1.41 Whilst there are no registered radioactive substances or explosive sites within 500m of Phase 3, the Envirocheck Report reveals a registered radioactive substance relating to the MOD is located approximately 850m west of Phase 3 and that 2 explosive sites are located within 800m of the Phase 3.
- 14.1.42 Whilst no landfills are located within 500m of Phase 3, a licensed waste management facility is located within 250m on Dux Court Road. It is noted for its use of waste in a deposit for recovery operation.
- 14.1.43 Phase 3 is located within Tidal Medway Drain A Nitrate Vulnerable Zone. This is a surface water NVZ.

Phase 4:

- 14.1.44 The Phase 1 – Desk Study and Preliminary Risk Assessment states that the potential sources of contamination within Phase 4 of the Proposed Works include:

- Made Ground (embankments, developed land);
- Run off from roadways;
- Electrical Substation;
- Depot (vehicles, possible tanks etc.); and
- Railway line.

14.1.45 3 discharge consents have been recorded within 250m of the Site. These include a sewage discharges – final/ treated effluent into freshwater stream consent and 2 sewage and trade combined – unspecified into tributary of Medway Estuary consents.

14.1.46 No landfills or licensed waste management facilities are located within 500m of Phase 4.

14.1.47 The Envirocheck Report also notes that there is an area of potentially infilled land (non-water) within 300m of Phase 4 which includes an area of unknown filled ground (pit, quarry etc.).

14.1.48 Phase 4 is located within Tidal Medway Drain A Nitrate Vulnerable Zone. This is a surface water Nitrate Vulnerable Zone (NVZ).

Phase 5/6:

14.1.49 For this phase, the Amey for Medway Council 2016 Preliminary Sources Study and Contamination Assessment Report for the A289 Four Elms to Medway Tunnel (report ref: CO04500055/GEO/02 Rev01) was used.

14.1.50 The Preliminary Sources Study and Contamination Assessment Report states that the potential sources of contamination within Phase 5/6 of the Proposed Works include:

- Run off from highways and surrounding hard standing areas (which may include heavy metals and polycyclic aromatic hydrocarbons;
- Constituents of Made Ground; and
- Off-site industry and commercial activities.

14.1.51 No environmental pollution incidents have been recorded within 500m of the phase (other than one discussed within the Phase 1 section).

14.1.52 Regarding pollution incidents to controlled waters, there are some within 500m of the site but they are already discussed within the Phase 1 section.

14.1.53 No discharge consents have been recorded within 250m of the Site at this phase, although there have been some recorded up to 1km away.

14.1.54 The report states that no landfills or licensed waste management facilities are located within 500m of Phase 5/6, although some are present at greater distances. According to Permitted Waste Site information downloaded from Defra, Manor Farm Barn Landfill and Recovery

Operation became licensed in March 2018 and is located within 500m south-west of Sans Pareil Roundabout.

- 14.1.55 The Envirocheck Report also notes that there are two areas of potentially infilled land (non-water) within 500m of Phase 5/6 which includes areas of unknown filled ground (pit, quarry etc.).
- 14.1.56 Phase 5/6 is located within North Kent Nitrate Vulnerable Zone. This is a groundwater NVZ.

Unexploded Ordnance

- 14.1.57 A Stage 2 Detailed UXO (Unexploded Ordnance) Risk Assessment (report ref: DRA-20-1158) has been completed by Brimstone Site Investigation. The following paragraphs summarise information stated in the Risk Assessment report.
- 14.1.58 Brimstone Site Investigation have concluded that UXO poses a Low Risk, Low-Moderate Risk and Moderate Risk to the Proposed Works. The UXO risks are posed by both German UXO and British/ Allied UXO. The risk of German UXO is associated with WWII bombings which occurred within or near to the study area. Records suggest that at least 14 air raids occurred within the study area, but that serious bomb damage did not occur to any buildings located within the boundary of the Site. It is highly likely that German aircraft flew over Phase 1, 2 and 3 and therefore there is a risk of unreported UXB (unexploded bombs). The sparsely populated/ rural nature of the scheme setting means that there is a greater chance that UXB were released unobserved and thus, unreported. However, the presence of army camps nearby, such as Wainscott Camp and Chattenden Barracks, mean that it is highly likely that bombs falling near to the army bases would have been investigated and located in the past. The report notes that checks would have been carried out along the railway line within Phase 4.
- 14.1.59 Potential UXO associated with British/ Allied forces can be attributed to either action during WWII or the presence of military and MOD land near to the Proposed Works. The Phase 1 site boundary borders the perimeter of the present-day MOD Wainscott Camp, although it is unlikely that large quantities of ammunition have been stored, handled or disposed of at this location. Parts of Phase 1 also pass through the former Chattenden Training Area where there is a potential for buried or discarded UXO to exist. Phase 2 covers part of the former Chattenden Barracks which would have stored munitions during WWII. Peripheral vegetation and the presence of woods nearby have the potential to hold UXO or munitions that could have disposed of in an unauthorised manner. Kingshill Barracks (located across part of Phase 3) were built during WWII and land in the surrounding fields which would have been used during WWII could potentially hold discarded/ buried ammunition. Some defended localities and stop-lines passed through Phase 3. These areas have an increased risk of UXO contamination and have been a source of UXO finds across present-day England. There is also a risk of UXO near the site attributed to a number of gun batteries across Medway land.
- 14.1.60 In terms of the likelihood of UXO remaining, risk attributed to the highway land is lower than that of the surrounding area. During the construction of the roads, excavations would have occurred and therefore reduces the risk of UXO being found in the immediate vicinity of the highway today. However, the surrounding land is predominantly used for agriculture and thus only topsoil will have been disturbed. This means that shallow buried UXO could remain. Single carriageway roads built across all four phases have a low risk from very shallow buried UXO (of both German and British origin).

- 14.1.61 Regarding the likelihood of UXO encounters within the boundary of the Proposed Scheme, the likelihood is low considering the depths of proposed ground works. German UXB could remain buried on Site, but at deeper depths than the proposed ground works. However, UXO could potentially be encountered where works are shallow in areas where there is an elevated likelihood of land service ammunition remaining buried in shallow depths on Site.
- 14.1.62 A consultation of risk maps provided in the Risk Assessment suggest that western parts of Phase 1 are at Low Risk of UXO remaining, whilst parts along Woodfield Way are at Low/ Moderate Risk and Moderate Risk. Western parts of Phase 2, where Chattenden Barracks was formerly located, are at Low/ Moderate Risk and Moderate Risk and eastern parts of the phase are at Low Risk. The highway and land immediately surrounding the highway are at Low Risk within Phase 3, but land to the north is classified as Low/ Moderate Risk and land to the south-west of the A228 Peninsula Way and Bell's Lane Roundabout is at Moderate Risk. Phase 4 is at Low Risk.
- 14.1.63 Regarding Phase 5/6, a Detailed Unexploded Ordnance (UXO) Threat & Risk Assessment was completed for the Four Elms to Medway Tunnel scheme by the Envirocheck Bomb Search team. This has deemed the risk level of the site as Low/Medium with the potential threat sources being mostly WW2 German bombs (with several Luftwaffe Targets in the immediately surrounding area), and residual threat from incendiary bombs and British Anti-Aircraft Ammunition projectiles used to defend against German bombing raids. As military activity is located in the surrounding area, there is the potential for Abandoned Explosive Ordnance, Small Arms Ammunition and Land Service Ammunition to be found. A map within the report suggests that there are less than 50 high explosive bombs within 1000 acres across the Phase 5/6 area.

Hydrology and Hydrogeology

- 14.1.64 Please refer to Section 10.1 for details of watercourses and groundwater within the Proposed Scheme footprint.

14.2. Potential Impacts of the Proposed Scheme

Construction

- 14.2.1 The Proposed Scheme has the potential to result in adverse impact during the construction phase. We propose that the following elements of assessment are scoped into the EIA:
- 14.2.2 The construction of the Proposed Scheme could establish potential pathways whereby contaminants / pollutants associated with construction activities, and other contaminated land, could have an impact on sensitive receptors, such as:
- human beings;
 - watercourses;
 - aquifers;
 - designated sites, such as Chattenden Woods and Lodge Hill SSSI;

- aquatic habitats, including those associated with the Medway Estuary and Marshes Ramsar Site, SSSI and SPA; and
- terrestrial habitats and protected species.

Operation

14.2.3 The Proposed Scheme has the potential to result in adverse impact during the operational phase. We propose that the following elements of assessment are scoped into the EIA:

- Impacts upon human health: site users, adjacent site users and maintenance workers are potentially at risk from contaminated soils at or near the surface through dermal contact, ingestion, and / or inhalation of fugitive dust;
- Impacts upon the water environment: the hydrogeology and hydrology of the site indicates that there is a mechanism (termed a source-pathway-receptor linkage) which could allow the local groundwater environment and soils to be impacted by the Proposed Scheme. The introduction of large structures and associated earthworks as part of the permanent works, could potentially result in localised impacts on human health and/or groundwater; and
- Impacts upon buried structures and infrastructure: sulphates have the potential to impact the integrity of buried concrete.

14.3. Impacts to be Scoped Out

14.3.1 The Proposed Scheme is unlikely to result in impacts upon geological designations as the nearest Regionally Important Geological Site is 2.4km to the south of Phase 5/6 in Chatham. It is proposed that this is scoped out of the EIA.

14.4. Proposed Assessment Methodology

14.4.1 There is the potential for disturbance of existing contaminated land and the possibility that construction could potentially establish pathways between pollutants and receptors. It is therefore intended that impacts on geology and soils will form part of the assessments within the ES.

Land Contamination Phase 1 Desk Study

14.4.2 The chapter will be informed by a Land Contamination Phase 1 Desk Study. This will comprise a desk-based review of all relevant information including historical mapping and any available ground investigation reports and, if necessary, a walkover survey to inspect the study area and obtain recent photography. Information from the PRA will be used to develop a preliminary Conceptual Site Model (CSM) which will identify potential 'source-pathway-receptor' contaminant linkages and associated estimated levels of risk.

14.4.3 Specific consultation with the Environment Agency and Environmental Health Officers (EHOs) will be undertaken to identify any potentially contaminated sites.

Significance of Effects

- 14.4.4 The significance of the effects of the Proposed Scheme may have on soil, geology and geomorphology attributes and contaminated land receptors will be assessed in accordance with DMRB guidance document LA 109 Geology and Soils. This details the criteria to be applied when assessing receptor value (sensitivity) and impact magnitude are presented within Table 51 and Table 52 respectively.

Table 51: Criteria for assessing asset value in the Geology and Soils impact assessment

(reproduction of Table 3.11 published in DMRB guidance document LA109)

Value (sensitivity)	Description of value / sensitivity
Very High	<p><u>Geology</u>: very rare and of international importance with no potential for replacement (e.g. UNESCO World Heritage Sites, UNESCO Global Geoparks, SSSI's and GCR where citations indicate features of international importance). Geology meeting international designation citation criteria which is not designated as such.</p> <p>Soils:</p> <p>Soils directly supporting an EU designated site (e.g. SAC, SPA, Ramsar); and / or ALC grade 1 & 2 or LCA grade 1 & 2</p> <p>Contamination:</p> <p>Human health: very high sensitivity land use such as residential or allotments;</p> <p>surface water: relevant sensitivity criteria presented in Table 36 of this report.</p> <p>groundwater: relevant sensitivity criteria presented in Table 36 of this report.</p>
High	<p><u>Geology</u>: rare and of national importance with little potential for replacement (e.g. geological SSSI, ASSI, National Nature Reserves (NNR)). Geology meeting national designation citation criteria which is not designated as such.</p> <p>Soils:</p> <p>Soils directly supporting a UK designated site (e.g. SSSI); and / or 2) ALC grade 3a, or LCA grade 3.1.</p> <p>Contamination:</p> <p>human health: high sensitivity land use such as public open space;</p> <p>surface water: relevant sensitivity criteria presented in Table 36 of this report.</p> <p>groundwater: relevant sensitivity criteria presented in Table 36 of this report.</p>
Medium	<p><u>Geology</u>: of regional importance with limited potential for replacement (e.g. RIGS). Geology meeting regional designation citation criteria which is not designated as such.</p> <p>Soils:</p> <p>soils supporting non-statutory designated sites (e.g. Local Nature Reserves (LNR), LGS's, Sites of Nature Conservation Importance (SNCIs)); and / or ALC grade 3b or LCA grade 3.2.</p> <p>Contamination:</p> <p>human health: medium sensitivity land use such as commercial or industrial;</p> <p>surface water: relevant sensitivity criteria presented in Table 36 of this report.</p> <p>groundwater: relevant sensitivity criteria presented in Table 36 of this report.</p>

Value (sensitivity)	Description of value / sensitivity
Low	<p><u>Geology</u>: of local importance / interest with potential for replacement (e.g. non designated geological exposures, former quarry's / mining sites).</p> <p><u>Soils</u>: ALC grade 4 & 5 or LCA grade 4.1 to 7; and / or soils supporting non-designated notable or priority habitats.</p> <p><u>Contamination</u>: human health: low sensitivity land use such as highways and rail; surface water: relevant sensitivity criteria presented in Table 36 of this report. groundwater: relevant sensitivity criteria presented in Table 36 of this report.</p>
Negligible	<p><u>Geology</u>: no geological exposures, little / no local interest.</p> <p><u>Soils</u>: previously developed land formerly in 'hard uses' with little potential to return to agriculture.</p> <p><u>Contamination</u>: human health: undeveloped surplus land / no sensitive land use proposed; surface water: relevant sensitivity criteria presented in Table 36 of this report. groundwater: relevant sensitivity criteria presented in Table 36 of this report.</p>

Table 52: Criteria for assessing impact magnitude in the Geology and Soils impact assessment
(reproduction of Table 3.12 published in DMRB guidance document LA109)

Magnitude of impact	Description of Impact Magnitude
Major	<p><u>Geology</u>: loss of geological feature / designation and/or quality and integrity, severe damage to key characteristics, features or elements.</p> <p><u>Soil</u>: physical removal or permanent sealing of soil resource or agricultural land.</p> <p><u>Contamination</u>:</p> <ul style="list-style-type: none"> Human health: significant contamination identified. Contamination levels significantly exceed background levels and relevant screening criteria (e.g. category 4 screening levels) with potential for significant harm to human health. Contamination heavily restricts future use of land; Surface Water: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced. Groundwater: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced.
Moderate	<p><u>Geology</u>: partial loss of geological feature / designation, potentially adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.</p> <p><u>Soils</u>: permanent loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource.)</p> <p><u>Contamination</u>:</p> <ul style="list-style-type: none"> Human health: contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria (e.g. category 4 screening levels). Significant contamination can be present. Control / remediation measures are required to reduce risks to human health / make land suitable for intended use;

Magnitude of impact	Description of Impact Magnitude
	<ul style="list-style-type: none"> • Surface Water: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced. • Groundwater: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced
Minor	<p><u>Geology</u>: minor measurable change in geological feature / designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.</p> <p><u>Soils</u>: temporary loss / reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource.)</p> <p><u>Contamination</u>:</p> <ul style="list-style-type: none"> • Human health: contaminant concentrations are below relevant screening criteria (e.g. category 4 screening levels) SP1010. Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health; • Surface Water: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced. • Groundwater: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced.
Negligible	<p><u>Geology</u>: very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature / designation. Overall integrity of resource not affected.</p> <p><u>Soils</u>: no discernible loss / reduction of soil function(s) that restrict current or approved future use.</p> <p><u>Contamination</u>:</p> <ul style="list-style-type: none"> • Human health: contaminant concentrations substantially below levels outlined in relevant screening criteria (e.g. category 4 screening levels) SP1010. No requirement for control measures to reduce risks to human health / make land suitable for intended use; • Surface Water: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced. • Groundwater: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced.
No Change	<p><u>Geology</u>: no temporary or permanent loss / disturbance of characteristics features or elements.</p> <p><u>Soils</u>: no loss / reduction of soil function(s) that restrict current or approved future use.</p> <p><u>Contamination</u>:</p> <ul style="list-style-type: none"> • Human health: reported contaminant concentrations below background levels; • Surface Water: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced. • Groundwater: relevant surface water criteria presented in Table 36 and Table 37 are to be referenced.

14.4.5 It is proposed that the standard assessment criteria, as presented in Table 4.

14.5. Assumptions and Limitations

- 14.5.1 This chapter is based upon the Proposed Scheme description (Chapter 2). These are likely to be subject to some further refinement, although the anticipated design changes are unlikely to impact the findings of this topic chapter.
- 14.5.2 The exact locations of construction compounds, haul roads, material and waste stores are currently not known but will be considered as appropriate in the ES.

14.6. References

- Brimstone Site Investigation. 2020. *Stage 2 Detailed UXO Risk Assessment (report ref: DRA-20-1158)*
- Geosphere Environment. 2020. *Phase 1 – Desk Study and Preliminary Risk Assessment for Phase 1-4, Hoo Peninsula, Kent (report ref: 4496,DS/DESK/AT,TP/17-03-20/V1)*
- Highways England. 2019. *Sustainability & Environment Appraisal (LA 109): Geology and Soils (Revision 0 October 2019)* (formerly DMRB Volume 11, Section 3, Part 11 & Part 6)

15. Other Environmental Considerations

15.1. Traffic and Transport

- 15.1.1 Assessments of impacts in relation to driver stress, non-motorised users and community severance are proposed within the Population and Health chapter. These assessments will be informed by the Transport Assessment for the scheme. The findings of these assessments will be referenced within the Traffic and Transport chapter.
- 15.1.2 It is proposed that the potential air quality impacts from vehicle emissions will be assessed within the Air Quality Chapter. In addition, the potential for traffic related noise and vibration effects will be assessed within the Noise and Vibration chapter. These assessments will be informed by a Transport Assessment. Where appropriate, the findings of these assessments will be cross referenced within the Population and Health Chapter.
- 15.1.3 It is considered that the potential traffic and transport effects will be sufficiently covered within the proposed scopes of the Population and Health, Air Quality and Noise and Vibration chapters. Therefore, we do not propose to include a stand-alone Traffic and Transport within the ES.

15.2. Major Accidents and Disasters

- 15.2.1 The potential for identified relevant major accident and/or disaster events to result in a significant adverse environmental effect will be evaluated using a risk-based approach. The approach will consider the environmental consequences of a risk scenario, the likelihood of these consequences occurring, taking into account planned design and embedded mitigation, and the acceptability of the subsequent risk to the environment. The process followed includes:
- identifying risks;
 - screening these risks;
 - defining the impact;
 - assessing the likelihood; and
 - then assessing the risk.

15.3. Heat and Radiation

- 15.3.1 The potential impact for heat and radiation from a Proposed Scheme must be considered in accordance with the requirements of the EIA Directive.
- 15.3.2 Considering the nature of the proposed infrastructure improvements, it is considered unlikely that significant effects will be experienced in relation to the heat and radiation and will therefore be scoped out of the EIA. Nevertheless, the potential for temperature impacts upon the Proposed Scheme as a result of climate change will be considered within the climate resilience assessment.

15.4. Lighting

- 15.4.1 The potential impact for impacts from lighting from the Proposed Scheme must be considered in accordance with the requirements of the EIA Directive.
- 15.4.2 It is anticipated that construction lighting will be required, particularly during winter months. The EIA will consider the potential impacts of this lighting in relation to sensitive receptors including nearby wildlife receptors and social receptors.
- 15.4.3 The operational lighting design for the Proposed Scheme is not currently known, but it is likely that alterations to the road network will prompt a change lighting and possibly a requirement for additional lighting.
- 15.4.4 It is currently unclear to what extent the lighting design will differ from the current baseline. It is anticipated that the potential impacts of the Proposed Scheme in respect of lighting will be considered by the relevant topic chapters in relation to:
- Landscape and visual impacts: where appropriate, the potential for impacts upon amenity value will be considered;
 - Nature Conservation: where appropriate, the potential for impacts upon the local ecology (bats) will be considered; and
 - Population and health: where appropriate, the potential nuisance effects upon people will be considered.

16. Summary

16.1. Summary of EIA Scoping

16.1.1 The proposed scope of the EIA, detailed within this report, is summarised in Table 54 below.

Table 53: EIA Summary

Topic	Inclusion in EIA	Summary of Scope
Assessment of Alternatives	Scoped in	It is proposed that the EIA considers the alternative design options including the do-nothing scenario.
Air Quality	Construction	
	Scoped in	<ul style="list-style-type: none"> construction dust; changes in vehicle emissions as a result of additional construction traffic.
	Operation	
	Scoped in	<ul style="list-style-type: none"> changes in vehicle emissions as a result of changes to traffic flow and traffic speeds as a result of road vehicles.
Noise and Vibration	Construction	
	Scoped in	<ul style="list-style-type: none"> noise and vibration effects from construction activities; ground-borne noise and vibration effects due to high energy construction activities; noise effects from construction vehicle movements; project-wide combined noise effects, and cumulative noise effects.
	Operation	
	Scoped in	<ul style="list-style-type: none"> airborne sound associated with increased road traffic.
	Scoped out	<ul style="list-style-type: none"> Impact of operational vibration on sensitive receptors
Nature Conservation	Construction	
	Scoped in	<ul style="list-style-type: none"> direct and indirect impacts upon European and nationally protected designated sites loss of adjacent habitat; disturbance of protected species.

Topic	Inclusion in EIA	Summary of Scope
	Scoped out	<ul style="list-style-type: none"> Impacts upon Impacts upon Tower Hill to Cockham Wood SSSI, Dalham Farm SSSI, Medway Estuary and Marshes SSSI, Medway Estuary MCZ, Northward Hill NNR.
	Operation	
	Scoped in	<ul style="list-style-type: none"> permanent loss of breeding and foraging habitat for protected species including bats, breeding birds and GCN; permanent increased disturbance to breeding and wintering birds; and permanent increased noise and vibration disturbance to adjacent designated sites.
	Scoped out	<ul style="list-style-type: none"> Impacts upon Impacts upon Tower Hill to Cockham Wood SSSI, Dalham Farm SSSI, Medway Estuary and Marshes SSSI, Medway Estuary MCZ, Northward Hill NNR.
Historic Environment	Construction	
	Scoped in	<ul style="list-style-type: none"> adverse effects upon the setting of heritage assets; the disturbance or loss of as unknown below-ground archaeological remains.
	Scoped out	<ul style="list-style-type: none"> Impacts upon World Heritage Sites, Registered Battlefields, Protected Wreck Sites and Registered Parks and Gardens.
	Operation	
	Scoped in	<ul style="list-style-type: none"> adverse effects upon the setting of heritage assets;
	Scoped out	<ul style="list-style-type: none"> Impacts upon World Heritage Sites, Registered Battlefields, Protected Wreck Sites and Registered Parks and Gardens.
Landscape and Visual	Construction	
	Scoped in	<ul style="list-style-type: none"> Removal of existing trees and hedgerows and loss of agricultural land. The loss of key landscape characteristics and the potential effects upon landscape character; Visual receptors including residential properties, public rights of way, Public Open Space, recreational areas, commercial properties. Temporary effects upon landscape character resulting from impact upon setting and perceptual quality as a result of construction activity.

Topic	Inclusion in EIA	Summary of Scope
	Scope out	<ul style="list-style-type: none"> N/A
	Operation	
	Scoped in	<ul style="list-style-type: none"> Impacts upon visual receptors; and Impacts upon landscape character, in particular perceptual qualities.
	Scoped out	N/A
The Water Environment	Surface Water	
	Scoped in	<ul style="list-style-type: none"> Pollution during construction due to increased generation and release of sediments and suspended solids, and increased risk of accidental spillage of pollutants such as oil, fuel and concrete associated with construction activities and site storage requirements; Loss or change to surface water supplies due to degradation of water quality, changes in drainage patterns or disruption to supply infrastructure due to the route options; Impacts upon the Medway Estuary and Marshes Ramsar Site, SSSI and SPA (via unnamed watercourses crossing near the highway and linking to the marshes), due to degradation of water quality during the construction period; Loss of standing water where infrastructure upgrades are constructed through or close to existing ponds or ditches; Indirect loss or changes to surface waters as a result of dewatering groundwater aquifers; Pollution during road operation due to contaminants within routine road run-off. A broad range of potential pollutants, such as hydrocarbons i.e. fuel and lubricants, fuel additives, metal from corrosion of vehicles, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road surface during rainfall events, polluting the receiving surface water bodies; Pollution during road operation due to accidental spillage. On all roads, there is a risk that accidents or vehicle fires may lead to an acute pollution incident. Where commercial vehicles are involved, potential pollutants that may be spilled could range from hazardous chemicals to milk, alcoholic beverages, organic sludges and detergents. Spilled materials may drain from the road surface, polluting the receiving surface water bodies; and

Topic	Inclusion in EIA	Summary of Scope
		<ul style="list-style-type: none"> Loss or change to surface water supplies due to degradation of water quality, changes in drainage patterns or disruption to supply infrastructure.
	Scoped out	<ul style="list-style-type: none"> N/A
	Groundwater	
	Scoped in	<ul style="list-style-type: none"> Pollution of groundwater and aquifers as a result of construction activities, such as excavation of cuttings; piling creating preferential pathways for contamination transmission to groundwaters, and seepage of spillages through ground profiles; Direct loss or changes to groundwater aquifers and groundwater supplies (licensed or unlicensed), either within the footprint of the Proposed Scheme or as a result of changes to groundwater flows and levels associated with dewatering of cuttings and foundation excavations or piling into the aquifer; Pollution of Groundwater Dependent Terrestrial Ecosystems, such as Chattenden Woods SSSI (located approximately 460m north-west of Phase 2) and Medway Estuary & Marshes SSSI (located approximately 1.2km south-east of Phase 2), as a result of construction activities or direct loss/ changes to groundwater flows; and Impacts upon groundwater resources from road runoff and the accidental spillage of pollutants.
	Scoped out	<ul style="list-style-type: none"> N/A
	Flooding	
	Scoped in	<ul style="list-style-type: none"> Increases in water level due to Proposed Scheme within the channel or floodplain; Loss of floodplain storage due to road infrastructure occupying areas which were previously available for flood storage or flows; Impacts upon the conveyance of floodwater and impediment of water flow caused by road infrastructure crossing existing drainage channels, causing potential blockage and altering local catchment area boundaries; The increase in surface water runoff due to any increase in impermeable area as a result of the Proposed Scheme; and The risk to the Proposed Scheme from flooding from groundwater, sewer and artificial sources.
	Scoped out	<ul style="list-style-type: none"> Flooding from reservoirs

Topic	Inclusion in EIA	Summary of Scope
Climate	Construction	
	Scoped in	<u>Green House Gas Assessment</u> <ul style="list-style-type: none"> • The manufacture and transportation of raw materials to suppliers; • The delivery and laying of materials; • Disposal of site arisings; and • Land use and land use changes. <u>Vulnerability of the Proposed Scheme to Climate Change</u> <ul style="list-style-type: none"> • Extreme weather; • Increased temperatures, prolonged periods of hot weather; and • Increased precipitation, and intense periods of rainfall.
	Scoped out	<u>Green House Gas Assessment</u> <ul style="list-style-type: none"> • Impacts in relation to forestry;
	Operation	
	Scoped in	<u>Green House Gas Assessment</u> <ul style="list-style-type: none"> • The potential for GHG emissions. Change in end-user emissions expected from the surrounding network and this will be included within Air Quality assessment. <u>Vulnerability of the Proposed Scheme to Climate Change</u> <ul style="list-style-type: none"> • changes in precipitation; • changes in temperature; • changes in wind; and • changes to Soil.
	Scoped out	<u>Green House Gas Assessment</u> <ul style="list-style-type: none"> • Impacts in relation to forestry; • Physical operation of the Proposed Scheme; • Decommissioning of the proposed scheme. <u>Vulnerability of the Proposed Scheme to Climate Change</u> <ul style="list-style-type: none"> • Impacts associated with sea surface temperatures and currents and waves; • Impacts associated with changes to annual average temperatures; and • Impacts associated with the changes to annual average humidity and evaporation.

Topic	Inclusion in EIA	Summary of Scope
Population and Human Health	Construction	
	Scoped in	<ul style="list-style-type: none"> • Loss of Agricultural Land • Impacts upon private assets • Community severance • Changes in driver stress and delay • Non-motorised users • Health Impacts
	Scoping out	<ul style="list-style-type: none"> • Demand on local services. • Crime and perception of crime
	Operation	
	Scoped in	<ul style="list-style-type: none"> • Changes in driver stress and delay; • Changes in driver stress and delay; • Changes in Accessibility for Non-Motorised Users; and • Health Impacts.
	Scope out	<ul style="list-style-type: none"> • Demand on local services; • Crime and perception of crime; and • private and public landholdings.
Material Assets and Waste	Construction	
	Scoped in	<ul style="list-style-type: none"> • Demolition: Production and disposal of Waste • Site Remediation and Preparation: Use of material resources • Site Remediation and Preparation: Production and Disposal of Waste • Proposed Scheme Construction: Use of material resources • Proposed Scheme Construction: Production and Disposal of Waste
	Scoped out	<ul style="list-style-type: none"> • Consumption of material resources during demolition:
	Operation	
	Scoped out	It is predicted that material consumption and the production and disposal of waste beyond the first year of operation are unlikely to give

Topic	Inclusion in EIA	Summary of Scope
		rise to significant effects. It is therefore proposed that this element scoped out of the EIA.
Geology and soils	Construction	
	Scoped in	It is proposed that the EIA considers potential pathways whereby contaminants / pollutants associated with construction activities, and other contaminated land, could have an impact on sensitive receptors, such as: <ul style="list-style-type: none"> • human beings; • watercourses; • aquifers; • aquatic habitats • terrestrial habitats and protected species.
	Scoped out	Impacts upon geological designations.
	Operation	
	Scoped in	<ul style="list-style-type: none"> • Impacts upon human health; • Impacts upon the water environment; and • Impacts upon buried structures and infrastructure.
	Scoped out	<ul style="list-style-type: none"> • Impacts upon geological designations.
Major Accidents and Disasters	Scoped in	Major accident and/or disaster events resulting in a significant adverse environmental effect will be evaluated.
Heat and Radiation	Scoped out	Unlikely that significant effects will be experienced in relation to the heat and radiation
Lighting	Construction	
	Scoped in	To be considered within the following chapters: <ul style="list-style-type: none"> • Landscape and Visual; • Nature Conservation • Population and Health
	Operation	
	Scoped in	To be considered within the following chapters: <ul style="list-style-type: none"> • Landscape and Visual; • Nature Conservation; • Population and Health

Topic	Inclusion in EIA	Summary of Scope
Cumulative Effects	Construction	
	Scoped in	Consideration of the cumulative effects of the proposed scheme during the construction phase of the Proposed Scheme.
	Operation	
	Scoped in	Consideration of the cumulative effects of the proposed scheme during the operation of the Proposed Scheme.

16.2. Proposed Structure of the Environmental Statement

16.2.1 In order to comply with Regulation 18(3) of the EIA Regulations, it is proposed that the ES comprises the following documents:

Environmental Statement Volume I: Written Statement

16.2.2 Volume I will present the written statement of the ES. The anticipated chapter contents are as follows:

- Introduction
- EIA Methodology
- Design Evolution and Assessment of Alternatives
- The Proposed Scheme
- Air Quality
- Noise and Vibration
- Nature Conservation
- Historic Environment
- Landscape and Visual
- Water Environment
- Climate Change
- Population and Human Health
- Material Assets and Waste
- Geology and Soils
- Cumulative Effects
- Summary of Residual Effects and Conclusions.

Environmental Statement Volume II: Figures

- 16.2.3 It is proposed that the majority of figures will be presented within Volume II of the ES. These will be cross referenced within the Written Statement (Volume I).

Environmental Statement Volume III: Technical Appendices

- 16.2.4 It is proposed that supporting documents and technical assessments are presented within Volume III of the ES. These will be cross referenced within the Written Statement (Volume I).

16.3. Environmental Statement: Non-Technical Summary

- 16.3.1 The Non-Technical Summary (NTS) document will provide a concise summary of the ES, which will include information regarding the Proposed Scheme, alternative designs that were considered, likely environmental effects and mitigation measures

Appendix A

Environmental Constraints Plans