A12 Chelmsford to A120 widening scheme

TR010060

7.3 Combined Modelling and Appraisal Report

Appendix E: Economic Appraisal Package – Appraisal Summary Table and Supporting Worksheets Report

APFP Regulation 5(2)(q)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 7

August 2022

Infrastructure Planning

Planning Act 2008

A12 Chelmsford to A120 widening scheme

Development Consent Order 202[ ]

7.3 COMBINED MODELLING AND APPRAISAL REPORT

APPENDIX E: ECONOMIC APPRAISAL PACKAGE – APPRAISAL SUMMARY TABLE PACKAGE AND SUPPORTING WORKSHEETS

Regulation Reference	Regulation 5(2)(q)
Planning Inspectorate Scheme Reference	TR010060
Application Document Reference	TR010060/APP/7.3
Author	A12 Project Team, National Highways

Version	**Date**	**Status of Version**
Rev 1	August 2022	DCO Application

CONTENTS

1 Introduction

1.1 Background

The Appraisal Summary Report and Worksheets is one of a series of documents that set out the scheme's traffic modelling and economic assessment. These include:

- Transport Data Package Report
- Transport Model Package Report
- Transport Forecasting Package Report
- Economic Appraisal Package Report
- Appraisal Summary Table and Worksheets
- Distributional Impacts Report

Each of these documents are provided as appendices to the overall Combined Modelling and Appraisal (ComMA) Report.

The purpose of this report is to present the Appraisal Summary Table (AST) and the supporting Transport Appraisal Guidance (TAG) worksheets for the impacts assessed associated with the A12 scheme.

The AST provides a summary of the scheme's impacts and estimates of costs and benefits to transport users and providers.

1.2 Structure of report

The remainder of the Appraisal Summary Report and Worksheets is set out as follows

- Chapter 2 – Appraisal Summary Table
- Chapter 3 – Economic Efficiency of the Transport System
- Chapter 4 – Public Accounts Table
- Chapter 5 – Analysis of Monetised Costs and Benefits
- Chapter 6 – Noise
- Chapter 7 – Air Quality
- Chapter 8 – Greenhouse Gases
- Chapter 9 – Landscape Impacts Worksheet
- Chapter 10 – Historic Environment Impacts Worksheet
- Chapter 11 – Biodiversity Impacts Worksheet
- Chapter 12 – Water Environment Impacts Worksheet
- Chapter 13 – Journey Quality Impacts Worksheet
- Chapter 14 – Security Impacts Worksheet

- Chapter 15 – Severance Impacts Worksheet

2 Appraisal Summary Table

The Appraisal Summary Table (AST) is shown in Table 2-1 on the following pages.

Table 2-1 Appraisal Summary Table

Date produced:	22/07/2022

Contact:	
Name	Tracey Harvey
Organisation	National Highways
Role	Senior Project Manager

Name of scheme:	A12 Chelmsford to A120 widening scheme
Description of scheme:	Widening the existing A12 to three lanes between Boreham Interchange (J19) and Marks Tey Interchange (J25). These works extend for a total of 15 miles (24km) and comprise two new three-lane bypasses, between the existing Junction 22 and 23; and between the existing Junction 24 and 25 respectively.

Impacts		Summary of key impacts	Assessment			
			Quantitative		Qualitative	Monetary	Distributional
						£m (NPV)	7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The proposed scheme will generate benefits for business users through addressing issues with the capacity and capability of the existing network. It will improve journey times along the route and reduce queuing at major junctions. The scheme is expected to provide significant journey time savings (£238.8m), and a small reduction in vehicle operating costs (£10.4m). The scheme is expected to provide disbenefits to road users during construction (-£26.5m). It will also reduce road user delays (£12.8m) during future maintenance compared to the 'without scheme' scenario.	**Value of journey time changes (£m)** £238.8 **Net journey time changes (£m)** 0 to 2min: -£2.2 / 2 to 5min: £159.5 / > 5min: £81.5		N/A	£235.5	
	Reliability impact on Business users	The proposed scheme will result in journey time reliability benefits to business users, due to a decrease in travel time variability (£31.9m) and a decrease in delays caused by incidents (£47.1m).	N/A		N/A	£78.9	
	Regeneration	Not assessed at this stage.	N/A		N/A	N/A	
	Wider Impacts	The journey time savings provided by the scheme are expected to lead to increased agglomeration, giving productivity benefits of £216.2m. As commuting costs fall due to the journey time savings, some people who would otherwise be priced out of the labour market due to high commuting costs would now be able to seek employment (£6.3m benefits). Increased output (the profit that firms make on additional outputs generated as a result of reduced transport costs) has been valued at £31.4m.	N/A		N/A	£253.9	
Environmental	Noise	The decreases in noise occur as a result of the alignment in some places moving away from residential areas and isolated dwellings (properties along Old London Road in Marks Tey, and in Rivenhall End). Reductions in noise are also due to the provision of low noise surfacing and the removal of a section of conrete road. The increases in noise are caused by an increase in traffic flow and speed along the online sections for the entire route, and also the alignment moving closer to some receptors along the offline sections of the route. Some of the increases in noise at dwellings along the offline sections of the route are minimised by the provision of noise barriers and earth bunds. The increases in noise are less at night than daytime due to there being less of an increase in traffic flow and speed at night. In terms of Distributional Impacts, the scheme results in noise disbenefit to all income quintiles. There are no receptors in the most deprived income quintile, however, the next two most deprived income quintiles both receive a greater disbenefit than their share of total population. Children and older people receive disbenefit in noise levels at home which is in line with the overall population. All school and care home receptors have negligible changes in noise.	Households experiencing increased daytime noise in forecast year: 3,911 Households experiencing reduced daytime noise in forecast year: 994 Households experiencing increased night time noise in forecast year: 3,664 Households experiencing reduced night time noise in forecast year: 952		N/A	-£6.6	Income quintile 2 & 3 = Large Adverse. Income quintile 4 = Moderate Adverse. Income quintile 5 (least deprived) = Slight Adverse. Impact on children and older people = neutral.
	Air Quality	Estimated increase in NO_x and PM_{10} emissions in both the 2027 opening year and 2042 design year using v3.1 of the National Highways speed-banded emission factors, which are based on Defra's Emission Factors Toolkit (v10). The change in emissions are caused by the increase in road length and road capacity with the proposed scheme in place. The proposed scheme results in a monetary disbenefit in terms of air quality emissions. One property (R225) near Boreham exceeded the AQO for annual mean NO_2 as a result of the scheme in 2027. Air quality within Lucy Lane North AQMA was adversely affected at receptor (R189) by the scheme. In accordance with DMRB LA 105, the magnitude of change in concentration at this receptor (0.9 µg/m3 increase) was deemed to be small. Overall the number of receptors exceeding AQO's in the DM and or DS scenarios were below the guideline number of properties that would constitute a likely significant effect according to the significance criteria in DMRB LA 105. Total monetised benefit over 60yr appraisal period: NO_x: - £9.7m PM_{10}: - £6.6m Total: -£16.3m In terms of Distributional Impacts, the scheme results in air quality disbenefits across all income quintiles for NO_2 and all but the middle quintile for PM_{10}. The most negatively impacted quintile is the second to least deprived.	Change in emissions NO_x (2027): +48.8 tonnes/year PM_{10} (2027): +4.1 tonnes/year NO_x (2042): +42.5 tonnes/year PM_{10} (2042): +5.5 tonnes/year NO_x (60 year appraisal period): +2,599 tonnes PM_{10} (60 year appraisal period): +318 tonnes		N/A	-£16.3	NO2: Income quintile 2 = Moderate Adverse, Income quintile 3 = Slight Adverse, Income quintile 4 = Large Adverse, Income quintile 5 (least deprived) = Moderate Adverse. Children receive disbenefit in NO2 levels at home in line with the overall population. One school and two nurseries receive a small increase in levels of NO2, therefore a score of slight adverse overall. PM10: Income quintile 2 = Moderate Adverse, Income quintile 3 = Large Beneficial, Income quintile 4 = Large Adverse, Income quintile 5 (least deprived) = Moderate Adverse. Children receive disbenefit in PM10 levels at home in line with the overall population. No school or nursery receptors receive a perceptible change in levels of PM10, therefore a score of neutral overall.
	Greenhouse gases	Estimated increase in road user GHG emissions in 2027 opening year (+28,682 tCO2e) and 2042 design year (+25,117 tCO2e) using Defra's Emission Factors Toolkit (v11). Changes are caused by an increase in vehicle kilometres travelled within the study area as a result of the Proposed Scheme. Estimated increase in road user GHG emissions over 60 yrs results in a monetary disbenefit.	Change in non-traded carbon over 60y (CO2e): 1,515,475 Change in traded carbon over 60y (CO2e): 20,084		N/A	-£113.4	

Environmental	Landscape	The proposed scheme would be set within the context of the existing A12. However, the proposed scheme would exacerbate the extent of highway infrastructure within the landscape and erode the rural character and sense of tranquillity, particularly where offline bypasses and major new junctions 21, 22 and 24 would encroach on the landscape surrounding the A12. Raised structures would present conspicuous elements that would be at odds within the low-lying landscape, particularly within valleys. Vegetation loss along online sections to accommodate widening would exacerbate views of traffic flow and highway infrastructure. Proposed planting would establish to reduce landscape and visual effects.	N/A	Moderate adverse	N/A	
	Townscape	NA	N/A	N/A	N/A	
	Historic Environment	Offline sections of the proposed scheme would remove non-designated archaeological remains identified as cropmarks, geophysical anomalies, and features recorded during trial trenching. A programme of archaeological mitigation involving a programme of archaeological excavation and dissemination of the results is proposed to mitigate this impact. No designated cultural heritage assets lie within the footprint of the proposed scheme, and mitigation for impacts on the setting of those affected has been proposed.	N/A	Moderate adverse	N/A	
	Biodiversity	Despite the impacts to ancient woodland and veteran trees, the proposed scheme would provide a benefit to biodiversity due to the net gain of habitats. Impacts to Perry's Woodland AW would be offset through woodland creation, and albeit this site is assessed as being of National value in line with DMRB guidance, the condition of the woodland is suboptimal. Similarly impacts to veteran trees are assessed as 'very large adverse' and albeit the diversity of nitrogen sensitive lichens they support could be reduced, the actual trees would be largely unaffected.	N/A	Very large adverse	N/A	
	Water Environment	The significance of effect for the water environment varies between Low Significance and Insignificant. The overall Assessment Score has been assessed as neutral. A number of embedded, standard and additional mitigations have been identified. Multiple watercourses have been identified as receiving surface water runoff, becoming encroached by proposed culverts, culvert extensions, bridges widening and outfall structures from the proposed scheme. Furthermore, channel realignments are also proposed. Seven of these are classified as Main Rivers by the Environment Agency under the Water Environment Regulations (WFD Regulations). All watercourses however, including those not classified under the WFD Regulations, have been assigned a low importance. All overall impacts are insignificant for hydromorphology. For water quality receptors are Low importance except for the River Blackwater, Boreham Brook and Domsey Brook which are of medium importance. With embedded mitigation for water quality treatment which typically comprises of SuDS features (i.e. ponds and swales) impacts are reduced and the magnitude is negligible resulting in an Insignificant effect.	N/A	Neutral	N/A	
Social	Commuting and Other users	The proposed scheme will generate benefits for commuters & other users through addressing issues with the capacity and capability of the existing network. It will improve journey times along the route and reduce queuing at major junctions. The scheme is expected to provide significant journey time savings (£284.8m), but an increase in vehicle operating costs (-£68.3m). The scheme is expected to provide disbenefits to road users during construction (-£34.3m). It will also reduce road user delays (£17.2m) during future maintenance compared to the 'without scheme' scenario.	**Value of journey time changes (£m)** £284.8 **Net journey time changes (£m)** 0 to 2min: -£7.0 / 2 to 5min: £192.2 / > 5min: £99.6	N/A	£199.4	Income quintile 1 (most deprived) & 2 = Moderate Adverse. Income quintile 3 = Slight Adverse, Income quintile 4 = Large Adverse, Income quintile 5 (least deprived) = Moderate Adverse.
	Reliability impact on Commuting and Other users	The proposed scheme will result in journey time reliability benefits to commuting and other users, due to a decrease in travel time variability (£38.3m) and a decrease in delays caused by incidents (£63.5m).	N/A	N/A	£101.8	
	Physical activity	Improving the A12 is unlikely to lead to increased numbers of walkers and cyclists nor is it likely to lead to longer trips for those that do. The proposed scheme is therefore expected to have minimal impact on physical activity.	N/A	Neutral	N/A	
	Journey quality	Improved journey quality due to a reduction in frustration from congestion and unreliability, more consistent junction layouts, and improved signing and other traveller information (e.g. Variable Message Signs). Existing issues with road surfacing, flooding and potholes will also be resolved as part of the scheme.	N/A	Large Beneficial	N/A	
	Accidents	The proposed scheme is predicted to result in a decrease in the number of fatal and serious casualties, but a small increase in slight casualties.	Number of Accidents saved by the scheme: -262 (increase in accidents) Number of Casualties saved by the scheme: Fatal 2, Serious 200, Slight -496	N/A	£13.1	No vulnerable group is expected to receive a particularly strong safety impact compared to the wider population.
	Security	The proposed scheme would offer slight improvements in security compared to the existing situation. CCTV, Stopped Vehicle Detection and emergency call facilities will be introduced, while limiting the access points to the A12 carriageway reduces the potential for disruption from unauthorised access. Moving bus stops away from high-speed heavily trafficked route may offer security benefits by improving car drivers awareness of bus stop users.	N/A	Slight Beneficial	N/A	
	Access to services	The scheme is not expected to affect accessibility to transport services, outside the improvements to journey times considered elsewhere in this Appraisal Summary Table.	N/A	Neutral	N/A	
	Affordability	No assessment has been undertaken for Public Transport Users, as the scheme is not expected to result in changes to public transport fares. A distributional impact assessment has been undertaken based on the changes in Vehicle Operating Costs to highway users. This shows that adverse impacts are forecast for all income groups. There are large adverse impacts for income group four. However the magnitude of the disbenefits is small and the lowest income group, which is sensitive to baseline cost of travel, is not significantly impacted.	N/A	N/A	N/A	
	Severance	Impact of severance for pedestrians is improved with the inclusion of improved crossing facilities. Some communities experience a decrease in traffic flows while others experience increases. Grade-separated crossing points replace current at-grade points, this will provide better and safer access for users as they will no longer require to wait for traffic to cross along the carriageway.	N/A	Moderate Beneficial	N/A	All vulnerable groups are expected to receive moderate reductions in severance, therefore a score of Moderate Beneficial. Uncontrolled crossings across the A12 would be replaced with bridges designed to be accessible to vulnerable users.
	Option and non-use values	The Scheme in itself does not substantially change the availability of transport services within the study area.	N/A	Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	Scheme costs have been calculated which take into account preparation, supervision, construction and land. These costs amount to £463.1m in 2010 market prices discounted to 2010. Change in road maintenance costs due to the scheme over 60 year period was also incorporated. This results in a reduction of maintenacnce costs of -£11.0m in 2010 market prices discounted to 2010.	N/A	N/A	£452.1	
	Indirect Tax Revenues	The scheme will generate an increase in indirect tax revenue from an increase in fuel consumption.	N/A	N/A	£29.1	

3 Economic Efficiency of the Transport System (TEE) Table

Non-business: Commuting	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
User benefits	TOTAL		Private Cars and LGVs	Passengers	Passengers	
Travel time	£115,778		£115,778			
Vehicle operating costs	-£31,030		-£31,030			
User charges	£0		£0			
During Construction & Maintenance	-£6,443					
NET NON-BUSINESS BENEFITS: COMMUTING	£78,305	*(1a)*				

Non-business: Other	ALL MODES		ROAD	BUS and COACH	RAIL	OTHER
User benefits	TOTAL		Private Cars and LGVs	Passengers	Passengers	
Travel time	£169,064		£169,064			
Vehicle operating costs	-£37,269		-£37,269			
User charges	£0		£0			
During Construction & Maintenance	-£10,717					
NET NON-BUSINESS BENEFITS: OTHER	£121,078	*(1b)*				

Business			Goods Vehicles	Business Cars & LGVs	Passengers	Freight	Passengers	
User benefits								
Travel time	£238,828		£158,047	£80,781				
Vehicle operating costs	£10,360		£8,429	£1,931				
User charges	£0		£0	£0				
During Construction & Maintenance	-£13,734							
Subtotal	£235,454	*(2)*						
Private sector provider impacts						Freight	Passengers	
Revenue	£0							
Operating costs	£0							
Investment costs	£0							
Grant/subsidy	£0							
Subtotal	£0	*(3)*						
Other business impacts								
Developer contributions	£0	*(4)*						
NET BUSINESS IMPACT	£235,454	*(5) = (2) + (3) + (4)*						

TOTAL		
Present Value of Transport Economic Efficiency Benefits (TEE)	£434,836	*(6) = (1a) + (1b) + (5)*

Notes: Benefits appear as positive numbers, while costs appear as negative numbers.
All entries are discounted present values, in 2010 prices and values

4 Public Accounts (PA) Table

	ALL MODES TOTAL		ROAD INFRASTRUCTURE	BUS and COACH	RAIL	OTHER
Local Government Funding						
Revenue	£0		£0			
Operating Costs	£0		£0			
Investment Costs	£0		£0			
Developer and Other Contributions	£0		£0			
Grant/Subsidy Payments	£0		£0			
NET IMPACT	£0	*(7)*	£0			
Central Government Funding: Transport						
Revenue	£0		£0			
Operating costs	£0		£0			
Investment Costs	£452,122		£452,122			
Developer and Other Contributions	£0		£0			
Grant/Subsidy Payments	£0		£0			
NET IMPACT	£452,122	*(8)*	£452,122			
Central Government Funding: Non-Transport						
Indirect Tax Revenues	-£29,140	*(9)*	-£29,140			
TOTALS						
Broad Transport Budget	£452,122	*(10) = (7) + (8)*				
Wider Public Finances	-£29,140	*(11) = (9)*				

Notes: Costs appear as positive numbers, while revenues and 'Developer and Other Contributions' appear as negative numbers.
All entries are discounted present values in 2010 prices and values.

5 Analysis of Monetised Costs and Benefits (AMCB) Table

Noise	-£6,550	*(12)*
Local Air Quality	-£16,325	*(13)*
Greenhouse Gases	-£113,418	*(14)*
Journey Quality		*(15)*
Physical Activity		*(16)*
Accidents	£13,090	*(17)*
Economic Efficiency: Consumer Users (Commuting)	£78,305	*(1a)*
Economic Efficiency: Consumer Users (Other)	£121,078	*(1b)*
Economic Efficiency: Business Users and Providers	£235,454	*(5)*
Wider Public Finances (Indirect Taxation Revenues)	£29,140	*- (11) - sign changed from PA table, as PA table represents costs, not benefits*
Present Value of Benefits (see notes) (PVB)	£340,773	*(PVB) = (12) + (13) + (14) + (15) + (16) + (17) + (1a) + (1b) + (5) - (11)*
Broad Transport Budget	£452,122	*(10)*
Present Value of Costs (see notes) (PVC)	£452,122	*(PVC) = (10)*
OVERALL IMPACTS		
Net Present Value (NPV)	-£111,349	NPV=PVB-PVC
Benefit to Cost Ratio (BCR)	0.8	BCR=PVB/PVC

Note : This table includes costs and benefits which are regularly or occasionally presented in monetised form in transport appraisals, together with some where monetisation is in prospect. There may also be other significant costs and benefits, some of which cannot be presented in monetised form. Where this is the case, the analysis presented above does NOT provide a good measure of value for money and should not be used as the sole basis for decisions.

6 Noise Worksheet

Proposal Name:	A12 Chelmsford to A120 Widening
Present Value Base Year	2010
Current Year	2022
Proposal Opening year:	2027
Project (Road, Rail or Aviation):	road

Net present value of change in noise (£):	-£6,550,142

*positive value reflects a **net benefit** (i.e. a reduction in noise)

Net present value of impact on sleep disturbance (£):	-£4,118,724
Net present value of impact on amenity (£):	-£1,799,037
Net present value of impact on AMI (£):	£254,897
Net present value of impact on stroke (£):	-£353,076
Net present value of impact on dementia (£):	-£534,202

Quantitative results

Households experiencing increased daytime noise in forecast year:	3911
Households experiencing reduced daytime noise in forecast year:	994
Households experiencing increased night time noise in forecast year:	3664
Households experiencing reduced night time noise in forecast year:	952

Qualitative Comments:

Day time noise levels have been predicted in accordance with the procedures set out in the "Calculation of Road Traffic Noise" and "Design Manual for Roads and Bridges LA 111 Revision 2".
Night-time noise levels have been derived through using TRL report "Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping", Method 3.
The number of properties predicted to experience 55dB L,night or greater in the future assessment year is 3130 with the scheme in place, and 2971 without the scheme in place. Therefore there are 159 more properties above the night-time SOAEL with the scheme in place.
0 properties are predicted to experience 80dB LAeq,16h or greater in the future assessment year with the scheme and 0 without the scheme in place
Of the 110 non-residential sensitive receptors assessed in the short term, 8 are expected to experience an adverse impact of minor magnitude or greater, whilst 46 are expected to experiance a beneficial impact of minor magnitude or greater.
In the long term, there are 5 expected to experience an adverse impact of minor magnitude or greater and 10 expected to experience a beneficial impact of minor magnitude or greater

Data Sources:

Environmental Agency Lidar DTM Data
Traffic Data
OS Mastermap
OS AddressBase Plus
3D Proposed Scheme Design

7 Air Quality

Air Quality Valuation Workbook: Worksheet 2 Regional Air Quality

Scheme name: A12 ES Stage 3 **Opening year:** 2027 **Forecast year:** 2042

		Without scheme		With scheme		Change in emissions	
		Opening year	Forecast year	Opening year	Forecast year	Opening year	Forecast year
NOx emissions in tonnes per year	Areas not exceeding limit values	288.31	238.29	336.90	280.77	48.59	42.48
	Areas exceeding limit values	1.23	0.00	1.43	0.00	0.21	0.00

Qualitative comments: The proposed scheme will result in net increases in emissions in the opening and forecast year scenarios.

Data sources: National Highways (formerly Highways England) speed-banded emission factors (v3.1; based on EFTv10); Traffic data for 2027 and 2042 was produced by the A12 Chelmsford to A12 PCF Stage 3 DCO traffic model.

Air Quality Valuation Workbook: Worksheet 3

Scheme Name: A12 ES Stage 3

Present Value Base Year 2010

Current Year 2021

Proposal Opening year: 2027

Project (Road/Rail or Road and Rail): Road Transport (RT)

Overall Assessment Score:

Damage Costs Approach (Emissions)

Present value of change in NOx emissions (£): -£9,720,510

Present value of change in PM2.5 emissions (£): £0

OR

Present value of change in PM10 emissions (£): -£6,604,461

Impact Pathways Approach (Concentrations)

Present value of change in NO2 concentrations (£): £0

Of which:

Concentration costs: £0

Other impacts: £0

Present value of change in PM2.5 concentrations (£):	£0
Of which:	
Concentration costs:	£0
Other impacts:	£0
Total Change	
Total value of change in air quality (£):	-£16,324,971
	*positive value reflects a **net benefit** (i.e. air quality improvement)

Quantitative Assessment:

Impact Pathways Approach (Concentrations)	
Change in NO2 assessment scores over 60 year appraisal period: (between 'with scheme' and 'without scheme' scenarios)	0.00
Change in PM2.5 assessment scores over 60 year appraisal period: (between 'with scheme' and 'without scheme' scenarios)	0.00
Damage Costs Approach (Emissions)	
Change in NOX emissions over 60 year appraisal period (tonnes): (between 'with scheme' and 'without scheme' scenarios)	2,599
Change in PM2.5 emissions over 60 year appraisal period (tonnes): (between 'with scheme' and 'without scheme' scenarios)	0
OR	
Change in PM10 emissions over 60 year appraisal period (tonnes): (between 'with scheme' and 'without scheme' scenarios)	318

Qualitative Comments:

The proposed A12 improvements will result in a net increase in total NO_x and PM_{10} emissions. The proposed scheme is a combination of online improvements to the existing carriageway and junctions, and new junctions and offline (bypass) road sections. The increase in road length and capacity would explain the increase in total emissions.

Sensitivity Analysis:

Upper estimate net present value of change in air quality (£):	-£57,712,459
Lower estimate net present value of change in air quality (£):	-£2,306,047

Data Sources:

Traffic data (2027 and 2042) for modelling were obtained from the A12 Chelmsford to A120 PCF Stage 3 DCO traffic model.
National Highways (formerly Highways England) speed-banded emission factors (v3.1) were applied (based on EFT v10).
The design year (2042) was modelled with 2030 emission factors. Traffic data was provided for 2042.
Speed banded emission factors are not available for $PM_{2.5}$. Therefore PM_{10} has been used for PM emissions. The EFT factors predict up to 2030. Future years beyond 2030 are represented by 2030 emission factors.
ArcGIS V10.8.1 was used to geo-align the road alignments and calculate link lengths.

8 Greenhouse Gases Worksheet

Scheme Name: A12 Chelmsford to A120 widening scheme

Present Value Base Year	2010
Current Year	2021
Proposal Opening year:	2027
Project (Road/Rail or Road and Rail):	road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):	-£113,418,394

*positive value reflects a **net benefit** (i.e. CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes): (between 'with scheme' and 'without scheme' scenarios)	1,535,559
Of which Traded	20084.18984
Change in carbon dioxide equivalent emissions in opening year (tonnes): (between 'with scheme' and 'without scheme' scenarios)	28,682
Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£): (N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)	-£1,444,452

*positive value reflects a **net benefit** (i.e. CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	199.8279961
Non-traded sector	0	0	0	28482.2734

Qualitative Comments:

Increase in road user GHG emissions as a result of increase in vehicle kilometres travelled in study area.

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):	-£170,127,592
Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):	-£56,709,197

Data Sources:

Road user GHG emissions calculated using Defra's Emission Factors Toolkit (v11).
Annual Average Daily Traffic flows, percentage Heavy Duty Vehicles, average speed (kph) and traffic model link length used.
Emissions calculated for entirety of Traffic Reliability Area for opening year (2027) and design year (2042)
Emissions interpolated between opening year and design year, then assumed to remain constant.

9 Landscape Impacts Worksheet

	Step 2	Step 3				Step 4
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Impact**
Pattern	This is a relatively flat, low lying and predominantly arable landscape, marked by watercourses including the River Chelmer, River Ter, River Brain, River Blackwater and Domsey Brook. Field pattern is generally medium to large, with enclosure provided by hedgerows and scattered small woodlands and copses. Willow and poplar plantations within the River Blackwater Valley are distinctive. The existing A12 corridor and the Great Eastern Main Line (GEML) sever the landscape. Settlement along the A12 comprises Chelmsford, Boreham, Hatfield Peverel, Witham, Kelvedon, Feering, Marks Tey and Copford. Away from the A12, there is a scattered settlement pattern and a network of narrow winding lanes.	Local	Common	Low/Local	Non-substitutable	The proposed scheme would be set within the context of the existing A12, although the offline bypasses and major new junctions 21, 22 and 24 would cause field severance and vegetation loss and would significantly affect the landscape pattern, land use and therefore landscape character. Raised structures would present conspicuous elements that would be at odds within the low-lying landscape, particularly within valleys. Online widening would involve vegetation loss adjacent to the highway, which would exacerbate the prominence of the A12 and traffic movement. **Moderate adverse**
Tranquillity	Tranquillity is described as being reduced close to urban centres and main transport infrastructure including the A12. There is a stronger sense of tranquillity and remoteness within rural areas away from urban centres and the main transport infrastructure, enhanced by woodland areas and valley topography.	Local	Common	Low/Local	Non-substitutable	The offline bypasses and major new junctions would increase the overall width of the A12 corridor and would therefore erode the rural character and sense of tranquillity. Vegetation loss along online sections to accommodate widening would exacerbate views of traffic flow and highway infrastructure. **Moderate adverse**
Cultural	Cultural heritage assets within the landscape and visual study area include five registered parks and gardens. In particular, Boreham House and New Hall Boreham are situated in close proximity to the proposed scheme. Within the study area there are also blocks of ancient woodland, several conservation areas and scheduled monuments and numerous listed buildings, which are particularly concentrated within the historic core of settlements such as Boreham, Hatfield Peverel, Witham, Little Braxted, Kelvedon, Inworth and Feering. A number of isolated listed buildings lie throughout the rural landscape surrounding the existing A12.	National	Common	Moderate / National	Non-substitutable	There would be a direct impact on a localised part of Boreham House Registered Park and Garden at its entrance, with vegetation loss along Main Road (B1137) and physical encroachment of Main Road across the entrance to the formal landscape. There would be effects on the setting, and views from, conservation areas and listed buildings surrounding the proposed scheme. **Moderate adverse**
Landcover	Largely arable, but some mixed, farmland with small scattered blocks of woodland, intersected by watercourses and rivers including the Blackwater and Ter. The existing A12 and GEML are dominating and have a strong influence on the landscape. Built development is focussed within the urban areas of Chelmsford, Boreham, Hatfield Peverel, Witham, Kelvedon, Feering, Marks Tey and Copford.	Local	Common	Low/Local	Substitutable	The proposed scheme would exacerbate the extent of highway infrastructure within the landscape, particularly where offline bypasses and major new junctions would encroach on the landscape surrounding the A12. Water bodies within attenuation and ecology ponds and borrow pits would change land use. **Moderate adverse**
Summary of character	This is a relatively flat, low lying and predominantly arable landscape, marked by watercourses. Field pattern is generally medium to large, with enclosure provided by hedgerows and scattered small woodlands and copses. Willow and poplar plantations within the River Blackwater Valley are distinctive. The existing infrastructure corridor containing the A12 and GEML is incongruous, and causes physical severance to the landscape. Settlement along the A12 comprises Chelmsford, Boreham, Hatfield Peverel, Witham, Kelvedon, Feering, Marks Tey and Copford. Tranquillity is described as being reduced close to urban centres and main transport infrastructure including the A12. Visual amenity is affected by the presence of the existing A12, although existing intervening vegetation including vegetation along parts of the highway corridor help to reduce the prominence of the highway infrastructure.	Local	Common	Low/Local	Non-substitutable	The proposed scheme would be set within the context of the existing A12. However, the proposed scheme would exacerbate the extent of highway infrastructure within the landscape and erode the rural character and sense of tranquillity, particularly where offline bypasses and major new junctions 21, 22 and 24 would encroach on the landscape surrounding the A12. Raised structures would present conspicuous elements that would be at odds within the low-lying landscape, particularly within valleys. Vegetation loss along online sections to accommodate widening would exacerbate views of traffic flow and highway infrastructure. Proposed planting would establish to reduce landscape and visual effects. **Moderate adverse**

Reference Sources

Department for Transport (2019), TAG UNIT A3 Environmental Impact Appraisal.
Braintree, Brentwood, Chelmsford, Maldon and Uttlesford Landscape Character Assessments (Chris Blandford Associates, 2006) and Colchester Borough Landscape Character Assessment (Chris Blandford Associates, 2005).

Step 5 - Summary Assessment Score

Moderate adverse

Qualitative Comments

The proposed scheme would be set within the context of the existing A12. However, the proposed scheme would exacerbate the extent of highway infrastructure within the landscape and erode the rural character and sense of tranquillity, particularly where offline bypasses and major new junctions 21, 22 and 24 would encroach on the landscape surrounding the A12. Raised structures would present conspicuous elements that would be at odds within the low-lying landscape, particularly within valleys. Vegetation loss along online sections to accommodate widening would exacerbate views of traffic flow and highway infrastructure. Proposed planting would establish to reduce landscape and visual effects.

10 Historic Environment Impacts Worksheet

Step 2		Step 3			Step 4
Feature	**Description**	**Scale it matters**	**Significance**	**Rarity**	**Impact**
Form	One scheduled monument lies approximately 50m south-east of the proposed scheme, and seven further scheduled monuments are located between 200m and 1km from the proposed scheme. There are 417 non-designated archaeological sites within 300m of the proposed scheme including assets from the prehistoric, Roman early medieval, medieval, Post-medieval and modern periods. This total also includes a number of newly identified archaeological sites of late prehistoric and Roman date detected during geophysical surveys and confirmed by trial trenching. Historic buildings within 300m of the proposed scheme includes two grade I listed buildings, eight grade II* listed buildings (a country house, four cottages or farmhouses, a public house, a former watermill, and a barn), 64 grade II listed buildings primarily comprising vernacular structures, two grade II registered parks and gardens, and three conservation areas. A further 351 designated historic buildings lie between 300m and 1km of the proposed scheme comprising typical rural public and private buildings such as churches, houses and vernacular structures. Five further conservation areas and two grade II and grade II* registered parks and gardens are also partially within 1km of the proposed scheme. The historic landscape types (HLTs) within 300m of the proposed scheme are characterised by rural forms such as enclosed fields and plantations with limited areas of woodland, industrial, infrastructure, leisure and urban landscapes.	Local to National	The scheduled monuments, listed buildings and registered parks and gardens are of national significance. The non-designated archaeological remains are of regional to local significance. Palaeolithic archaeological remains at Colemans Farm are of regional significance. Non-designated HLTs are of regional to local significance.	Scheduled monuments, grade I and II* listed buildings are rare at a national level. Grade II listed buildings are rare at a regional level. Archaeological remains identified to be of regional significance are rare at a regional level. The non-designated HLTs identified to be of Regional significance are rare at a regional level.	Construction of the existing A12 is likely to have disturbed buried archaeology within the highway estate. However, the proposed scheme has the potential to remove archaeological remains where it extends outside of the existing highway boundary. In particular, the proposed offline section between junction 24 and junction 25 would have a moderate adverse effect through the removal of archaeological remains associated with cropmarks and geophysical anomalies, as would proposed new and improved junctions, borrow pits, balancing ponds and other elements. Construction and operation of the proposed scheme would affect the setting of heritage assets through visual and noise impacts. Construction of the offline section of the proposed scheme has the potential to remove portions of 15 non-designated HLTs.
Survival	Archaeological sites are preserved principally as below-ground remains. Evaluation of archaeological sites by trial trenching has shown survival to be variable ranging from poor to good. The preservation of historic buildings, conservation areas, and registered parks and garden is good. The preservation of HLTs is moderate to good.	Local to National	The survival of archaeological remains is important to the understanding of human activities in the landscape and is a major factor in their significance. The survival of designated and non-designated historic buildings, including conservation areas, is important in terms of the historic character of the area and greatly influences their significance. The survival of historic parks and gardens and non-designated HLTs contributes to the character of the area and to the understanding its development.	Scheduled monuments, grade I and II* listed buildings are rare at a national level. Grade II listed buildings are rare at a regional level. Archaeological remains identified to be of regional significance are rare at a regional level. The non-designated HLTs identified to be of Regional significance are rare at a regional level.	The removal of known and unknown archaeological remains during construction of the proposed scheme would have an impact on their survival. Where removal or partial removal cannot be avoided, mitigation through excavation, recording and dissemination of the results would be undertaken. Construction and operation of the proposed scheme would not affect the survival of historic buildings. There would be a physical effect on HLTs during construction of the proposed scheme through the removal of elements like field boundaries. Effects during construction can be mitigated through recording.
Condition	The condition of archaeological remains and HLTs has the potential to be damaged by agricultural practices and development. Historic buildings are generally well managed and are therefore in good stable condition with some modernisation for continued use. Conservation areas and registered parks and gardens are typically in good condition, but have the potential to deteriorate through lack of proper management and/or development.	Local to National	The condition of archaeological remains is important for a complete understanding of the asset and is a factor in their significance. The condition of historic buildings, including conservation areas, is important in terms of the historic character of the area and greatly influences their significance. The condition of historic parks and gardens and non-designated HLTS is important to the character of the area and to understanding its development.	Archaeological remains and HLTs in this condition are not uncommon in the region. Scheduled monuments, regardless of condition, are rare at a national level. Non-designated archaeological remains and HLTs in this condition are not uncommon in the region. Grade I and II* listed buildings are rare at a national level; grade II listed buildings are rare at a regional level, regardless of condition.	The removal of known and unknown archaeological remains during construction would impact upon their condition. Where removal or partial removal cannot be avoided, mitigation through recording and dissemination of results would be undertaken. There is no predicted change to the condition of historic buildings. There would be a physical effect on the condition of 15 non-designated HLTs during construction through the removal of sections of field boundaries. Effects during construction can be mitigated through recording.
Complexity	The majority of archaeological remains and sites are of Low complexity. However, prehistoric occupation and field system sites can be relatively complex through coverage of large areas and including evidence for use across chronological periods. The older historic buildings and the churches tend to be more complex. Their interrelationships with each other or other heritage assets, and their setting can add to their complexity. This includes conservation areas and registered parks and gardens. Overall this has been assessed to be of Medium complexity. The HLTs are of Low complexity.	Local to National	The complexity of archaeological remains directly contributes to their significance. The complexity of historic buildings can directly contribute to their significance if it contributes to its aesthetic, evidential, historical, and/or communal value. The complexity of HLTs contributes to their significance by illustrating their time depth.	Low complexity archaeological remains are common regionally. High complexity archaeological remains are rare regionally. Scheduled monuments and grade I and II* listed buildings, regardless of complexity, are rare at a national level; grade II listed buildings, regardless of complexity, are rare at a regional level. Low complexity HLTs are common at a regional level.	The partial or total removal of archaeological remains would have a negative impact to their complexity. Where removal or partial removal cannot be avoided, mitigation through excavation, recording and dissemination of results would be undertaken. Construction and operation of the proposed scheme has the potential to affect the setting of historic buildings and their complexity, especially where these form part of a group or complex or have other interrelationships. During construction it may be possible to reduce these effects through construction best practice. During operation it may be possible to mitigate these effects through landscape planting and screening. There is a potential impact on the complexity of HLTs through severance of land parcels and field boundaries. Effects during operation can be mitigated by landscape planting to improve historic landscape fit.
Context	Essex is a rich county archaeologically and the study area contains a range of cultural heritage assets representing half a million years of occupation and settlement in this part of Essex. Below-ground archaeological sites preserve evidence of earlier agricultural systems and settlements within a post-medieval and modern agricultural landscape. The current A12 is situated along the Roman Road from London to Colchester. It lies within an ancient landscape with a distinct sense of enclosure. The archaeological remains, historic buildings, and historic landscape reflect this wider context. Locally, the setting and context of the majority of historic buildings is characterised by isolated farmsteads, small groups of assets within conservation areas, and/or by their location near to the existing A12 and the historic routes that preceded it. The rural setting of many of these assets is an important aspect of their character and context.	Local to National	The context of archaeological remains can contribute to their significance; however, the majority of archaeological remains identified within the study area primarily derive significance from their physical remains rather than their setting. The context and setting of historic building make a significant contribution to their significance.	The context of archaeological remains and historic buildings within the wider historic landscape is common for the region.	As the significance of the archaeological sites identified within the study area is primarily derived from their physical remains rather than their setting, no significant residual effects on their settings during construction or operation are predicted. There is potential for effects on the settings of historic buildings from noise and visual impacts during construction and operation. During operation it would be possible to mitigate these effects through landscape planting and screening.
Period	The earliest known archaeological sites affected by the proposed scheme date from the Palaeolithic and Neolithic, but there have been chance finds from the Mesolithic Period. The majority of known archaeological remains date to the Bronze Age, but archaeological work has revealed further remains from the Iron Age, Roman, and Medieval periods. There are also post-medieval and modern remains. Historic buildings and HLTs date from between the medieval to modern periods, with the majority dating to the post-medieval period.	Local to National	The range of periods represented by the archaeological remains, historic buildings and historic landscape is important in terms of understanding the development of the area and can add significance to an asset.	The range of periods represented by the archaeological remains, historic buildings and historic landscape is common for this region.	Construction of the proposed scheme would not impact upon the range of periods represented by the archaeological remains, but it has the potential to reduce evidence of certain periods through removal of archaeological remains. Where removal or partial removal cannot be avoided, mitigation through excavation, recording and dissemination of results would be undertaken. This would ensure that the information embodied in the archaeological remains would be preserved and used to enhance understanding.

Reference Sources

A12 Chelmsford to A120 Widening Environmental Statement, Chapter 7: Cultural Heritage [TR010060/APP/6.1]
Appendix 7.1: Cultural Heritage Gazetteer [TR010060/APP/6.3]
Appendix 7.2: Cultural Heritage Desk Based Assessment [TR010060/APP/6.3]

Step 5 - Summary Assessment Score

Moderate adverse effect

Qualitative Comments

Offline sections of the proposed scheme would remove non-designated archaeological remains identified as cropmarks, geophysical anomalies, and features recorded during trial trenching. A programme of archaeological mitigation involving a programme of archaeological excavation and dissemination of the results is proposed to mitigate this impact. No designated cultural heritage assets lie within the footprint of the proposed scheme, and mitigation for impacts on the setting of those affected has been proposed.

11 Biodiversity Impacts Worksheet

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Blackwater Estuary Special Protection Area (SPA) and Ramsar	Internationally designated site for its estuarine complex of intertidal mudflats fringed by saltmarsh, shingle and shell banks, and offshore islands.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance or hydrological changes due to the distance of the designated site from the proposed scheme.	**Neutral**
Abberton Reservoir SPA and Ramsar	Abberton Reservoir is the largest freshwater body in Essex and is internationally designated for being one of the most important reservoirs in Britain for wildfowl.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance impacts due to the distance of the designated site from the proposed scheme. No hydrological connectivity.	**Neutral**
Alde-Ore SPA and Ramsar	Internationally important site designated for its range of well-preserved habitat and notable bird assemblage year-round.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance impacts due to the distance of the designated site from the proposed scheme. No hydrological connectivity.	**Neutral**
Colne Estuary SPA and Ramsar	A branching estuary subject to international designation for supporting important mudflat habitat.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance or hydrological changes due to the distance of the designated site from the proposed scheme.	**Neutral**
Crouch and Roach Estuaries SPA and Ramsar	An internationally designated site for its estuarine habitats, significant numbers of birds and assemblages of invertebrates and plants.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance impacts due to the distance of the designated site from the proposed scheme. No hydrological connectivity.	**Neutral**
Dengie SPA and Ramsar	Tidal mudflats and saltmarshes internationally designated for important coastal flora.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance impacts due to the distance of the designated site from the proposed scheme. No hydrological connectivity.	**Neutral**
Outer Thames Estuary SPA	Internationally designated site for its diversity of marine habitats and important bird assemblage.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance impacts due to the distance of the designated site from the proposed scheme. No hydrological connectivity.	**Neutral**
Stour and Orwell Estuaries SPA and Ramsar	Internationally important wetland designated for its wintering bird assemblage and nationally scarce plants.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance impacts due to the distance of the designated site from the proposed scheme. No hydrological connectivity.	**Neutral**
Essex Estuaries Special Area of Conservation (SAC)	Coastal plain estuarine system of international importance designated for its diverse range of marine and estuarine communities and rich invertebrate fauna.	International	Very high - the site is designated for importance on an international scale	N/A	**Very high**	**Neutral**. No disturbance or hydrological changes due to the distance of the designated site from the proposed scheme.	**Neutral**
River Ter (Sites of Special Scientific Interest) SSSI	Nationally important lowland stream designated for its distinctive floor regime and interesting morphology.	National	High - the site is of national importance	N/A	**High**	**Neutral**. No hydrological impacts as the site is upstream of the proposed scheme.	**Neutral**
Tiptree Heath SSSI	Nationally important heathland designated for its acid grassland, dwarf shrub heath and rare flora.	National	High - the site is of national importance	N/A	**High**	**Neutral**. No impacts from changes in nitrogen deposition. No other pathway to impact.	**Neutral**
Whetmead Local Nature Reserve (LNR) and Local Wildlife Site (LWS)	Previous landfill site now comprising unimproved grassland and lagoons. Supports a range of butterflies and dragonflies, and seed-eating birds.	Regional	Medium - the site is a former landfill that now mainly consists of unimproved grassland and scrub	N/A	**Low**	**Neutral**. Habitat loss would be offset through the provision of new habitats in an area immediately south of the site.	**Neutral**
Braxted Park LWS	An extensive mosaic of semi-improved meadows, broadleaved woodland, parkland, open water, reed and sedge beds.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Minor negative**. Less than 1% of the site is affected by an increase in nitrogen deposition.	**Slight adverse**
Brockwell Meadows LNR and LWS	Associated with the River Blackwater, comprising a water meadow, woodland, a pond and hedgerows.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Minor negative**. No effects from hydrological changes. 1.5% of the site is affected by an increase in nitrogen deposition.	**Slight adverse**
Boreham Road Gravel Pits LWS	A series of lakes of various sizes which has a diverse habitat of scrub, swamp and open water.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Minor negative**. Less than 1% of the site is affected by an increase in nitrogen deposition.	**Slight adverse**
Cook's Lane Lexden LWS	Mosaic of acidic grassland and broadleaved woodland.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Minor negative**. Less than 3% of the site is affected by an increase in nitrogen deposition.	**Slight adverse**
Inworth Wood LWS	A locally important ancient woodland.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Neutral**. There would be no effects on the site.	**Neutral**
Mope Wood Complex LWS	Three woodlands with good numbers of ancient woodland indicator species.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Neutral**. There would be no effects on the site.	**Neutral**
Perry's Wood LWS	An ancient woodland with good canopy and understorey structure.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Major negative**. More than 20% of the site is affected by an increase in nitrogen deposition.	**Moderate adverse**
River Chelmer LWS	A locally important wildlife corridor supporting riparian habitats.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Neutral**. There would be no effects on the site.	**Neutral**
Riverside Meadows LWS	A locally important meadow supporting interesting flora.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Neutral**. There would be no effects on the site.	**Neutral**
Sandon Riverside LWS	Locally designated site supporting broadleaved, mixed and yew woodland.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Neutral**. There would be no effects on the site.	**Neutral**
Smyth's Green LWS	A small but diverse area of rough grassland and scrub.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Neutral**. The extent and duration of nitrogen deposition are small/short.	**Neutral**
The Grove LWS	A locally important streamside woodland.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Neutral**. There would be no effects on the site.	**Neutral**
West House Wood LWS	A locally important site supporting ancient woodland.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Neutral**. The duration of nitrogen deposition is temporary and reversible.	**Neutral**
Perry's Wood ancient woodland	An ancient woodland with good canopy and understorey structure.	National	High - desgnated as ancient woodland	N/A	**High**	**Major negative**. More than 20% of Perry's Wood AW is affected by an increase in nitrogen deposition.	**Very large adverse**
Wet woodland 7	An area of Annex I habitat: wet woodland	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Minor negative**. This area would be temporarily dewatered during the construction phase.	**Slight adverse**
Wet woodland 1 and marshy grassland 1	Areas of ground water dependent terrestrial habitats.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Minor negative**. This area would be temporarily dewatered during the construction phase.	**Slight adverse**
Wet woodland 8	Areas of ground water dependent terrestrial habitats.	Regional	Medium - contains habitats of county importance	N/A	**Medium**	**Minor negative**. This area would be temporarily dewatered during the construction phase.	**Slight adverse**
Verified and potential veteran/ancient trees	Very old trees of high ecological value as identified from the Woodland Trust Inventory or through field surveys.	National	High - NPPF refers to ancient/veteran trees as irreplaceable habitat of exceptional biodiversity, cultural or heritage value.	N/A	**High**	**Major negative**. Four potential veteran trees would be lost to construction of the project, this is considered to be a low proportion of the total potential veteran trees within 1km of the Order Limits. Changes in nitrogen deposition during construction are temporary. Construction impacts are assessed as minor, however during operation there would be an increase in nitrogen deposition for six verified veteran trees, 16 potential veteran trees and one verified ancient tree, assessed as major adverse.	**Very large adverse**

Lowland mixed deciduous woodland	A priority habitat under the UK Biodiversity Action Plan (BAP). Woodland areas consisting predominantly of deciduous species, encompasses a range of woodland types from ancient to semi-natural.	National	High - priority habitats are considered of national importance	Declined by 30-40% in last 50 years[1].	**Medium**	**Minor negative**. Only small areas of priority habitat would be lost during construction, with the majority being retained. Mitigation would be provided through habitat creation, but it is acknowledged that for some habitats it would take a significant time to mature to the quality of habitats being lost.	**Slight adverse**
Eutrophic standing water	Priority habitats are described in the UK BAP, in the context of this proposed scheme those listed are predominately associated with the margins of arable land.	National	High - priority habitats are considered of national importance	Data not available	**Medium**	**Minor negative**. Some areas of priority habitat would be lost during construction.	**Slight adverse**
Hedgerows	Priority habitats are described in the UK BAP, in the context of this proposed scheme those listed are predominately associated with the margins of arable land.	National	High - priority habitats are considered of national importance	Data not available	**Medium**	**Positive**. There would be a net gain in hedgerow habitat.	**Moderate beneficial**
Open mosaic habitats	Priority habitats are described in the UK BAP, in the context of this scheme those listed are predominately associated with the margins of arable land.	National	High - priority habitats are considered of national importance	Data not available	**Medium**	**Neutral**. There would be no change in the area of this habitat.	**Neutral**
Other habitats	Grassland, shrub and wetland habitats	Local	Low - these habitats are important at a local scale	Data not available	**Low**	**Positive**. The proposed scheme would provide a net gain of habitats.	**Slight beneficial**
Bats	An assemblage of species including barbastelle bat, brown long-eared bat, common pipistrelle, Leisler's bat, Myotis spp., Nathusius' pipistrelle, noctule, and soprano pipistrelle, using the site for roosting and/or foraging and/or commuting.	Regional	Medium - roosts are largely for commoner species and generally support small numbers of bats. Habitats support a typical abundance and diversity of species.	Stable (Daubenton's bat, whiskere/Brandts bat, serotine, nocutle and brown long-eared) or increasing (Natterer's, common and soprano pipistrelle).[2]	**Medium**	**Minor negative**. Due to temporary adverse impacts during construction, including loss of foraging and commuting habitat, impacts to bats are assessed as slight adverse.	**Slight adverse**
Badger	Multiple clans of badgers using the site for foraging and sett building.	Local	Low - this species is common and widespread	Increasing[3]	**Low**	**Neutral**. A total of 42 badger setts would be closed under licence prior to construction works, including two main setts. Due to the mitigation of impacts and the resilience of the species no negative impacts are anticipated. Direct mortality from operation of the proposed scheme would be mitigated through embedded means such as fencing and culverts to dissuade crossing of the carriageways and provide alternative crossing points.	**Neutral**
Otter	Confirmed presence of otter on the River Blackwater, Domsey Brook and Rivenhall Brook.	Regional	Medium - the site supports populations of county importance	Increasing[3]	**Medium**	**Neutral**. Otter commuting and foraging habitat may be temporarily impacted during the construction phase, but commuting corridors would be maintained wherever practicable. Bridges and culverts are being designed to allow passage for otters during the operational phase. With mitigation it is considered there would be no long-term or significant impacts to otters. The provision of mammal ledges in culverts on watercourses that cross the proposed scheme would reduce the likelihood of mortality from vehicles during the operational phase of the scheme by providing alternative crossing points. Additionally, water pollution from operation of the proposed scheme would be mitigated through embedded means such as attenuation ponds.	**Neutral**
Water vole	Water vole latrines and burrows confirmed on one watercourse (Domsey Brook) and two ditches to the south of junction 19, indicating low-density populations of water voles in these areas.	Regional	Medium - the site supports populations of county importance	Decreasing[3]	**Medium**	**Positive**. Water vole presence is highly localised within the study area, with two small populations identified. During construction water voles could be impacted by increased disturbance, but this would be temporary and limited to the movement of construction traffic. The proposed scheme would create wildlife-friendly water features such as ponds and ditches in proximity to the existing populations, resulting in a net gain of habitats suitable for water vole. The provision of mammal ledges in culverts on watercourses that cross the proposed scheme would reduce the likelihood of mortality from vehicles during the operational phase of the scheme by providing alternative crossing points. Additionally, water pollution from operation of the proposed scheme would be mitigated through embedded means such as attenuation ponds.	**Moderate beneficial**
Dormouse	Dormice are likely to be absent from the main scheme but may be present along some of the gas main options, pending the results of surveys.	Regional	Medium - the site may support populations of county importance (pending completion of surveys)	Decreasing[3]	**Medium**	**Neutral**. Dormice have not been identified within the study area and are therefore considered unlikely to be impacted by the proposed scheme.	**Neutral**
Notable species	Brown hare, hedgehog, polecat and toads.	Regional	Medium - these species are considered of County importance.	Hedgehog - decreasing[3]. Other species - data unavailable.	**Medium**	**Positive**. Construction activity may result in temporary disturbance of such species but standard mitigation would avoid direct mortality as well as the majority of disturbance. In the longer term these species would benefit from the creation of mitigation and landscaping areas that should increase the overall areas of suitable habitat compared to current conditions.	**Moderate beneficial**
Barn owl	Muiltiple barn owl roost sites (excludes breeding sites) within the study area. Limited areas of sub-optimal foraging habitat, and very limtied small parcels of optimal foraging habitat within the Order Limits.	Regional	Medium - this species is considered of County importance.	Possibly declining[4]	**Medium**	**Neutral**. No nest sites would be lost from construction of the proposed scheme although four roost sites may be lost. Through standard mitigations, disturbance to roosting or nesting barn owls would be mitigated, and it is not anticipated that construction of the proposed scheme would significantly alter existing foraging habitat. In the long term barn owls should benefit from the creation of new habitats which may support a greater abundance of prey species than the existing landscape.	**Neutral**
Breeding birds	36 species of breeding birds confirmed present within the study area, with a fruther 15 probable breeders and 18 possible breeders. Inlcudes red, amber and green list species.	Regional	Medium - due to the presence of species of county importance.	Variable, many species increasing; however, many including turtle dove are declining[4]	**Medium**	**Neutral**. Construction is likely to result in the temporary loss of nesting habitat through physical land take and clearance, and disturbance. However, it is considered unlikely to result in a negative impact on the conservation status of any species affected. In the long term the creation of new habitats would provide new foraging and nesting opportunities as well as mitigating the loss of other habitats.	**Neutral**
Wintering birds	31 species of conservation or legal status present within study area.	Local	Low - species assemblages are typical of the habitats	Data not available	**Low**	**Neutral**. Although wintering birds may be temporarily impacted by disturbance associated with construction of the proposed scheme, the study area was not considered to be of particular importance to wintering birds in the context of the wider county. If notable species recorded, they were not in significant numbers for the region. Key habitats would remain unchanged, and the creation of new habitats may be beneficial to wintering birds in the long-term.	**Neutral**
Common reptiles	Assemblages of common lizard, grass snake and slow worm within most suitable habitats, with one survey area supporting all three species.	Local	Low - species are relatively common and widespread	Data not available	**Low**	**Positive**. The species of common reptiles identified within the study area are common and widespread throughout the wider landscape. Construction of the proposed scheme would result in the loss of some areas of reptile habitat, although direct mortality would be minimised through mitigation such as translocation activities prior to construction. The creation of new reptile habitats and better connectivity would result in a net gain of habitat suitable for reptiles.	**Slight beneficial**

Great crested newt (GCN)	Breeding within 20 ponds within the study area around the proposed scheme. Suitable terrestrial and confirmed breeding ponds within the Order Limits.	Regional	Medium - this species is considered of County importance.	Data not available	**Medium**	**Positive**. Core habitat (<50m) of confirmed GCN ponds would be directly impacted by construction of the proposed scheme as well as habitats associated with 11 others confirmed GCN ponds. Mitigation would be delivered through Natural England's district level licensing process and would comprise the creation of a number of new ponds designed to increase GCN habitat and connectivity between existing populations within and outside of the study area. The GCN populations retained within and nearby to the proposed scheme would also benefit from newly created ponds and habitats provided to mitigate the loss of other habitats and impacts to other species.	**Moderate beneficial**
Freshwater fish	Notable or legally protected species present within six watercourses.	Regional	Medium - this species is considered of County importance.	Data not available	**Medium**	**Neutral**. Freshwater fish would be impacted by disturbance associated with the construction of the proposed scheme. Additionally, in-channel piling in several of the watercourse has the potential to deter fish from sections of the watercourses where excessive noise and vibrations transmits into the watercourse. However, where percussive piling is required, a soft start would be implemented to allow time for fish to move from the works before levels of noise and percussion may become harmful. Where practical, in-channel works would avoid fish spawning and migrating periods. Standard mitigation would be applied to avoid water pollution. Although some fish habitat would be lost as a result of modification of crossing structures, watercourse realignments have been designed to provide additional freshwater fish habitat and make improvements for biodiversity.	**Neutral**
Terrestrial invertebrates	Notable species of conservation concern recorded in all five survey sites. Small heath butterfly (IUCN near threatened, NERC S41) present in two survey locations.	Regional	Medium - these species are considered of County importance.	Data not available	**Medium**	**Positive**. Terrestrial invertebrates would be affected by the proposed scheme through loss of some habitat, most notably at Whetmead LNR and LWS. However, habitat creation across the proposed scheme would benefit terrestrial invertebrates and their assemblage.	**Moderate beneficial**
Freshwater macro-invertebrates	Six out of seven surveyed watercourses had sufficient macro-invertebrate richness to achieve 'good' status, with the seventh watercourse achieving 'moderate' status.	Local	Low - species are relatively common and widespread	Data not available	**Low**	**Neutral**. Freshwater macro-invertebrates could be affected by construction of the proposed scheme through direct mortality during in-channel works and habitat loss. Water pollution would be avoided through standard mitigation. Some freshwater habitats would be lost due to modification of crossing structures. However, watercourse realignments have been designed to provide additional habitat and make improvements for biodiversity.	**Neutral**
Notable plants	28 notable plant species have been identified within the study area of which some are of County value (others are of local value)	Regional	Medium - includes species which are considered of County importance.	Data not available	**Medium**	**Minor negative**. Notable plants would be impacted through disturbance and removal as a result of site clearence. They would be avoided and working areas demarcated to prevent encroachment in the first instance. Where practicable they would be translocated into advanced ecology mitigation areas.	**Slight adverse**
Freshwater macrophytes	One notable freshwater macrophytes, river water-dropwort, was identified within the River Blackwater.	Regional	Medium - includes a species which is considered of County importance.	Data not available	**Medium**	**Neutral**. Freshwater macrophytes have the potential to be impacted by through habitat loss, due to shading of watercourses as a result of bridge and culvert construction. Water pollution would be avoided through standard mitigation measures. It is not anticipated that any direct destruction or removal of notable freshwater macrophyte species would occur.	**Neutral**

Reference Sources

Department for Transport (2021) TAG Unit A3, Environmental Impact Assessment

[1] https://data.jncc.gov.uk/data/2829ce47-1ca5-41e7-bc1a-871c1cc0b3ae/UKBAP-BAPHabitats-30-LowlandMixedDecWood.pdf

[2] National Bat Monitoirng Programmed, Annual Report 2020, Bat Conservation Trust and JNCC [https://cdn.bats.org.uk/uploads/pdf/Our%20Work/NBMP/National-Bat-Monitoring-Programme-Annual-Report-2020.pdf?v=1621498216]

[3] A review of the population and conservation status of British mammals: Technical Summary, Matthews et al (2018) [https://www.mammal.org.uk/wp-content/uploads/2021/06/MAMMALS-Technical-Summary-FINALNE-Verision-FM3290621.pdf]

[4] BirdTrends 2020: trends in numbers, breeding sccuess and survival for UK breeding birds [https://www.bto.org/our-science/publications/birdtrends/2020]

Summary Assessment Score

In line with Chapter 5 (DfT, 2013), the most adverse category aproach to the summary assessment score has been adopted, and the overall impact is assessed as very large adverse so as not to dilute the assessment.

Qualitative Comments

Despite the impacts to ancient woodland and veteran trees, the proposed scheme would provide a benefit to biodiversity due to the net gain of habitats. Impacts to Perry's Woodland AW would be offset through woodland creation, and albeit this site is assessed as being of National value in line with DMRB guidance, the condition of the woodland is suboptimal. Similarly impacts to veteran trees are assessed as 'very large adverse' and albeit the diversity of nitrogen sensitive lichens they support could be reduced, the actual trees would be largely unaffected.

12 Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Study area: For surface water quality and hydromorphology, watercourses have been assessed within a 1 km study area. Groundwater study area of 1km was adopted.									
Potential Impacts:									
Surface Water Quality: Potential pollution of surface waters via discharge of road runoff from the proposed scheme and accidental spillages. Water quality assessments have been undertaken on the outfalls and SuDS treatment has been included for the majority of outfalls as mitigation for routine runoff impacts. Assessments show spillage risk is within acceptable limits.	Boreham Brook Domsey Brook d/s	River: Transport and dilution of waste products	Medium. WFD Regulations (Regs) Waterbodies: Boreham Brook - Overall Good classification (2019) Domsey Brook - Overall Good classification (2019)	Local	Low	Limited	Medium	Negligible	Insignificant
	River Blackwater		Low: River Blackwater - Overall Moderate classification (2019)	Regional	Low	Limited	Medium	Negligible	Insignificant
	River Ter River Brain Roman River		Low. WFD Regs Waterbodies: River Ter - Overall Moderate classification (2019) River Brain - Overall Moderate classification (2019) Roman River - Overall Moderate classification (2019)	Local	Low	Limited	Low	Negligible	Insignificant
	River Chelmer		Low. WFD/WER Waterbody: River Chelmer - Overall Poor classification (2019)	Local	Low	Limited	Low	Negligible	Insignificant
	Rivenhall Brook		Low: Not classed as WFD Regs waterbodies	Local	Low	Limited	Low	Negligible	Insignificant
	Ordinary Watercourses 1, 1a, 1b, 2, 3a, 28, 28a, 7, 7a, 32, 9, 9a, 10, 11, 12, 12a, 13, 13a, 14, 15, 15a, 16, 17, 18, 19, 20, 21, 21a, 23, 24, 26, 31, 31b, 32, 33, 34, 35, 36, 36b, 37, 37b, 38, 39, 40,			Local	Low	Limited	Low	Negligible	Insignificant
Groundwater flows: Dewatering effects (long- and/or short-term) associated with earthworks such as road cuttings/widening and borrow pits are likely to locally lower groundwater levels and promote groundwater flow laterally and vertically towards the works. These risks have been assessed in relation to all primary and secondary receptors. The presence of permanent below-ground structures within the shallow aquifer, most notably sheet piles, have the potential to locally alter groundwater levels and flows. The long-term impact of embankments could result in local compaction of the superficial aquifer deposits. Flood storage compensation areas which are permeable could act as areas of enhanced groundwater recharge potentially increasing groundwater levels locally. Groundwater quality: Piling has the potential to create temporary pathways for poor quality perched groundwater to migrate aquifer units or confined deeper horizons. Piling techniques can also introduce sediments or contaminated soils to an aquifer body as material is pushed down by the piling technique. The works also have the potential to impact on groundwater quality (and water quality associated with secondary receptors) from accidental spillage or releases during construction activities. Drainage outfalls to ditches or streams with predicted low flow rates may impact groundwater quality as the discharge is likely to infiltrate to ground.	Secondary A, B and undifferentiated aquifers	Conveyance of flow, water supply (yield & quality), biodiversity, transport and dilution of waste product, ground settlement	Use of water supply (both licensed and unlicensed), vulnerability of shallow groundwater, 1 small SPZ1, 2 local nature reserves & 1 local wildlife site as refined potential GWDTE located directly within or adjacent to the Order Limits and likely to be impacted by the proposed scheme, presence of heritage assets and listed buildings	Regional	Common	None	High	Minor Adverse	Low significance
	Licensed groundwater abstractions			Local	Common	Feasible	High	Minor Adverse to Negligible	Low significance
	Unlicensed groundwater abstractions			Local	Common	Feasible	Medium	Minor Adverse to Negligible	Insignificant
	SPZ (including default SPZ)			Local	Common	Feasible	Medium	Minor Adverse to Negligible	Insignificant
	GWDTE			Local	Common	None	Medium	Minor Adverse to Negligible	Insignificant
	Surface water receptors			Local	Common	Limited	Medium to Low	Negligible	Insignificant
	Buildings, including heritage assets and listed buildings			Local	Common	Feasible to Limited	Medium	Minor Adverse to Negligible	Insignificant
Hydromorphology: The presence of outfalls: Disturbance to the bed and banks, loss of riparian vegetation, channel instabilities and increased fine sediment during construction. Channel instabilities and changes to both flow and sediment regimes during operation.	River Chelmer Boreham Brook River Ter River Blackwater Roman River Ordinary Watercourses 1a, 2, 7, 9, 10, 11, 12, 13, 13a, 15a, 17, 18, 21a, 23, 24, 26, 31, 31b, 32, 37, 37b, 38, 39, 40, 41 and 42		WFD Regs Waterbodies: River Chelmer - Poor ecological classification (2019) River Ter - Moderate ecological classification River Blackwater - Moderate ecological classification (2019) Roman River - Moderate ecological classification (2019) Boreham Brook - Good ecological classification (2019) Domsey Brook - Good ecological classification (2019) Non WFD Regs waterbodies: Ordinary Watercourses 1a, 2, 7, 9, 10, 11, 12, 13, 13a, 15a, 17, 18, 21a, 23, 24, 26, 31, 31b, 32, 37, 37b, 38, 39, 40, 41 and 42	Local	Low	Limited	Low	Minor Adverse to negligible	Insignificant
Hydromorphology: The presence of proposed culverts and culvert extensions. Construction activities would include: Disturbance to bed and bank material, loss of riparian vegetation and bed substrate compaction. Operation impacts would include: Replacement of natural bed and bank material, changes to flow and sediment regimes, lead to localised scour of the bed and banks.	River Ter River Brian River Blackwater Roman River	River: Conveyance of flow and material, Biodiversity and Aesthetic	WFD Regs Waterbodies: Roman River - Moderate ecological classification (2019) Domsey Brook - Good ecological classification (2019) Non-WFD Regs designated water bodies: Rivenhall Brook Ordinary Watercourses 1, 1a, 2, 7, 9, 10, 11, 12, 13, 13a, 15a, 17, 21a, 23, 24, 26, 37 and 37b	Local	Low	Limited	Low	Minor Adverse	Insignificant
Hydromorphology: The presence of widened bridges Construction activities would include: Disturbance to bed and bank material, loss of riparian vegetation and bed substrate compaction. Operation impacts would include: Replacement of natural bank material, localised scour of the bed and banks.	River Brain River Blackwater Domsey Brook		WFD Regs Waterbodies: River Brain - Moderate ecological classification (2019) River Blackwater - Moderate ecological classification (2019) Domsey Brook - Good ecological classification (2019)	Local	Low	Limited	Low	Minor adverse	Insignificant
	River Ter		WFD Regs Waterbodies: River Ter - Moderate ecological classification (2019)	Local	Low	Limited	Low	No change	Insignificant

Hydromorphology: Channel realignments Construction: Largely offline but the following impact would take place at tie-in locations: Disturbance of bed and banks, fine sediment release, loss of riparian vegetation. Operation impacts include: Localised scour of bank material, changes to flow and sediment regimes.	Rivenhall Brook Domsey Brook Roman River Ordinary Watercourses 1, 2, 7, 9, 10, 12, 13, 13a, 17, 21a, 24, 26, 37 and 37b		WFD Regs Waterbodies: Roman River - Moderate ecological classification (2019) Domsey Brook - Good ecological classification (2019) Non-WFD Regs designated water bodies: Rivenhall Brook Ordinary Watercourses 1, 2, 7, 9, 10, 12, 13, 13a, 17, 21a, 24, 26, 37 and 37b	Local	Low	Limited	Low	Minor adverse	Insignificant
Flood Risk: Increase in fluvial flood risk due to works within floodplain of watercourse	Ordinary Watercourses 7, 21, 21A, 23 and 26, Rivenhall Brook, River Blackwater, Domsey Brook	Conveyance of flow	Flood flow routes/floodplain	Local	Low	Limited	Low	Major Adverse	Low significance
Flood Risk: Works within floodplain of watercourse - potential impact due to mitigation measures as part of proposed scheme	Ordinary Watercourses 21 and 26	Conveyance of flow	Flood flow routes/floodplain	Local	Low	Limited	Low	Major Beneficial	Low significance

Reference Sources

Catchment Data Explorer (Environment Agency, 2021)

Summary Assessment Score

The significance of effect for the water environment varies between Low Significance and Insignificant. The overall Assessment Score has been assessed as Neutral as the vast majority of effects have been classified as Insignificant.

Qualitative Comments

A number of embedded, standard and additional mitigations have been identified. Multiple watercourses have been identified as receiving surface water runoff, becoming encroached by proposed culverts, culvert extensions, bridges widening and outfall structures from the proposed scheme. Furthermore, channel realignments are also proposed. Seven of these are classified as Main Rivers by the Environment Agency under the Water Environment Regulations (WFD Regulations). All watercourses however, including those not classified under the WFD Regulations, have been assigned a low importance. All overall impacts are insignificant for hydromorphology. For water quality receptors are Low importance except for the River Blackwater, Boreham Brook and Domsey Brook which are of medium importance. With embedded mitigation for water quality treatment which typically comprises of SuDS features (i.e. ponds and swales) impacts are reduced and the magnitude is negligible resulting in an Insignificant effect.

13 Journey Quality Impacts Worksheet

Factor	Sub-factor	Better	Neutral	Worse
Traveller Care	Cleanliness		No change in cleanliness expected	
	Facilities			Parking bays removed for safety reasons
	Information	Variable Message Signs will be introduced to give travellers information on road conditions.		
	Environment	There will be a consistently high standard of road surfacing to improve driving quality. Existing maintenance issues (flooding, potholes, etc) will be resolved as part of the scheme.		
Travellers' Views	-		No significant change in the quality of travellers views is expected	
Traveller Stress	Frustration	The scheme will reduce congestion and significantly improve journey time reliability.		
	Fear of potential accidents	Safety improved. Design standards will be higher than the existing route which has a mixture of different levels of design standard. Removal of direct accesses. Removal of parking bays. Improved conditions for walkers / cyclists / horseriders.		Parts of the existing route have average speed cameras - these will be removed as part of the scheme
	Route uncertainty	The proposed scheme has fewer junctions. All junctions and signing will be of a consistent modern standard. Improved information available for road users.		

Reference Source

Summary Assessment Score

Large Beneficial. This is based the overall beneficial nature of changes, and the large amount of travellers affected (over 50,000 travellers per day)

Qualitative Comments

Improved journey quality due to a reduction in frustration from congestion and unreliability, more consistent junction layouts, and improved signing and other traveller information (e.g. Variable Message Signs). Existing issues with road surfacing, flooding and potholes will also be resolved as part of the scheme.

14 Security Impacts Worksheet

Security Indicator	Relative importance	Without scheme	With scheme
	(High/Medium/Low)	(Poor/Moderate/High)	(Poor/Moderate/High)
Site perimeters, entrances and exits	**Medium**: There is potential for disruption to the road network through unauthorised access by walkers/cyclists/horseriders. In particular this may affect the strategically important site at Essex Fire and Rescue HQ.	**Moderate**: direct accesses, at-grade crossing locations and routes for walkers & cyclists within highway boundary.	**High**: no direct accesses except at junctions, no walkers/cyclist/horse rider facilities within highway boundary. Improvements to fences.
Formal surveillance	**Medium**: Surveillance and traffic monitoring, whilst primarily used for observing road conditions, may offer additional security benefits to walkers/cyclists/horseriders.	**Poor**: No CCTV available	**High**: CCTV for surveillance is proposed as well as Stopped Vehicle Detection, which means a stationary vehicle is promptly identified and attended, with benefits to safety, assurance and security.
Informal surveillance	N/A	N/A	N/A
Landscaping	**Low**: Security risk posed by landscaping issues is considered low for both drivers & walkers / cyclists.	**Moderate**: No known security issues relating to landscaping	**Moderate**: design will be prepared to avoid introducing security issues for drivers and walkers/cyclists.
Lighting and visibility	**Low:** There is existing lighting at junctions and on some links, which is not considered to present a security risk. Potential issues with visibility issues relating to bus users.	**Moderate:** In terms of visibility, bus stop users are potentially vulnerable owing to exposed & relatively remote locations (next to high speed heavily trafficked road).	**High:** Bus stop users will be on quieter local access roads rather than the main A12 carriageway, providing greater visibility and therefore additional security.
Emergency call	**Low**: security risk is considered to be low for both drivers & pedestrians.	**Poor**: limited emergency call facilities available	**Moderate**: emergency call facilities provided at places of relative safety.

Approximate Number of Users Affected

Total walkers/cyclists/horseriders and bus users affected is likely to be small (less than 500 travellers per day in total).
The number of road users is much higher (over 50,000 travellers per day in places), but the security impact on these users is considered to be low.

Reference Source

Walker, Cyclist & Horse Rider surveys carried out during a typical weekday and Sunday during school term in July 2016.

Summary Assessment Score

Slight beneficial

Qualitative Comments

The proposed scheme would offer slight improvements in security compared to the existing situation. CCTV, Stopped Vehicle Detection and emergency call facilities will be introduced, while limiting the access points to the A12 carriageway reduces the potential for disruption from unauthorised access. Moving bus stops away from high-speed heavily trafficked route may offer security benefits by improving car drivers awareness of bus stop users.

15 Severance Impacts Worksheet

Change in Severance	Population Affected												
	J19	Boreham	Hatfield Peverel	J21	Witham Bypass	Eastways	Rivenhall End	Essex Fire & Rescue HQ	Kelvedon and Feering	Inworth	Easthorpe Road	Marks Tey	Total Affected
IMPACT	**Large Positive** Additional grade-separated crossing facilities will be provided, where currently they are uncontrolled at-grade.	**Slight Negative** The scheme is forecast to increase traffic flows through Boreham which would increase severance to a moderate level of severance. However, speed restrictions are proposed on Maind Road, in particular the current 40mph speed limit through the village itself would be reduced to 30mph. The lower speed limits may help reduce perceived severance.	**Slight Positive** The scheme is forecast to reduce traffic flows on The Street which would reduce severance.	**Large Positive** Improved high-quality walking & cycling facilities will be provided: grade-separated crossing and a parallel route along carriageway	**Large Positive** Grade-separated crossing to be provided. Severance to users on footpaths 12195 and 121103 will be reduced.	**Moderate Positive** Pedestrian stage incorporated into the new signals at this junction.	**Moderate positive** The A12 currently cuts through the village of Rivenhall End at grade. The proposed realignment of the A12, coupled with de-trunking of the existing A12 through the village and installation of toucan crossings, means there would potentially be a degree of relief from community severance. Bus services can provide more accessible bus stops on the LAR, compared to their current location on the A12 mainline. However, the proposed scheme would result in a less direct route for pedestrians between the Fair Rest community and Rivenhall End.	**Large Positive** Additional grade-separated crossing, linking existing Public Right of Ways currently severed by the route, to provide access to recreational areas in Blackwater Valley	**Slight positive** Traffic flows on the B1024 London Road, on the west side of Kelvedon, are anticipated to reduce with the scheme in place, resulting in a slight reduction in severance in this part of the village.	**Slight negative** The increase in flows could potentially increase severance (actual and perceived) within the village, particularly at peak traffic times. However, given that traffic volumes are already high, it is uncertain whether the perception of severance would be particularly noticeable for most people.	**Large Positive** Grade-separated crossing facilities will be provided.	**Slight Positive** No major impacts relating to community severance or social networks are expected on the communities of Marks Tey. However, at J25 the scheme will provide improved crossing facilities, improved walking & cycling facilities, and link existing Public Rights Of Way.	
Large negative													
Moderate negative													
Slight negative		Approximate resident population of Boreham settlement = 3,000								Approximate resident population of Inworth settlement = 100			
Neutral													
Slight positive			Approximate resident population of Hatfield Peverel settlement = 4,000						Approximate resident population of Kelvedon & Feering settlements = 7,500			Over 100 users per day (but latent demand may be higher)	
Moderate positive						Unknown but likely to be over 100 users per day	Around 100 users per day (but latent demand may be higher)						
Large positive	Over 100 users per day (but latent demand may be higher)			Less than 50 users per day (but latent demand may be higher)	Less than 50 users per day (but latent demand may be higher)			Around 50 users per day at present.			Less than 50 users per day		**At least 1,000 users**

Reference Source

Walker, Cyclist & Horse Rider surveys carried out during a typical weekday and Sunday during school term in July 2016.

Summary Assessment Score

Moderate Beneficial. This is based on the overall reductions in severance, and the moderate number of people likely to be affected by this.

Qualitative Comments

Impact of severance for pedestrians is improved with the inclusion of improved crossing facilities. Some communities experience a decrease in traffic flows while others experience increases.
Grade-separated crossing points replace current at-grade points, this will provide better and safer access for users as they will no longer require to wait for traffic to cross along the carriageway.