

M4 Junction 17 OBC

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OBC Environment Appraisal Report

25/08/22

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1. Introduction

This report presents the findings of the environmental appraisal for the M4 Junction 17 Scheme Outline Business Case (OBC).

The appraisal methodology for environmental factors is described in Transport Analysis Guidance (TAG) Unit A3, Environmental Impact Appraisal (DfT, 2015) and is supported by WebTAG Environmental Worksheets. The findings of this appraisal process are summarised under the Environmental Objective of the Appraisal Summary Tables (AST) which are then used to present the results of a transport scheme appraisal as part of a business case. As the main output from WebTAG appraisal, the relevant AST output is presented in Appendix B of this OBC.

The topics covered within the WebTAG appraisal include air quality, greenhouse gases, noise, biodiversity, water environment, landscape, townscape and the historic environment. Geology and soils is not a WebTAG topic however, an assessment of the impacts of the Scheme has been included in this report.

The following sections detail the key impacts associated with each topic and the level of impact, reflecting the scale of the WebTAG Distributional 7-pt scale / vulnerable group.

The full environmental WebTAG worksheets are presented in Appendix A to G in this report.

2. Environmental Appraisal

2.1. Air quality

2.1.1. Appraisal methodology

A desk-based study has been completed using the principles outlined in TAG Unit A3 Chapter 3¹ published May 2022. Given that the Scheme is expected to have minimal impact on existing traffic conditions, a proportionate approach was taken which included an examination of local air quality constraints within 200 m of the Scheme extent in line with the Design Manual for Roads and Bridges (DMRB) LA105 Air Quality² and a quantitative appraisal following the damage costs approach in accordance with TAG Unit A3 Chapter 3.

The quantitative appraisal included a calculation of the change in emissions of NO_x and PM₁₀ as a result of the Scheme for the road links within the traffic reliability area³. The National Highways air quality spreadsheet model v9, based on Defra vehicle emission factor toolkit (EFT v11.0) was used to calculate emissions.

The change in pollutant emissions as a result of the Scheme was calculated in the opening (2026) and future forecast (2036) years. The spreadsheet linearly interpolates between these two years and extrapolates the changes in emissions post the future 2036 year over the 60-year appraisal period, assuming no change post 2036, and calculates the monetary value of change in air quality.

2.1.2. Study Area

For the baseline information the study area was within 200 m from the Scheme extent, as shown in Figure 2-1 below. This distance of 200 m from roads follows industry best practice as specified in DMRB LA105 Air Quality.

¹ Department for Transport - TAG UNIT A3 -Environmental Impact Appraisal, July 2021. Available online at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/999917/tag-unit-A3.pdf [Accessed August 2021]

² Highways England Design Manual for Roads and Bridges (DMRB) 'LA105 Air Quality', November 2019. Available online at: <https://www.standardsforhighways.co.uk/prod/attachments/10191621-07df-44a3-892e-c1d5c7a28d90>. [Accessed August 2022]

³ "The traffic scoping criteria is only be applied to the area covered by the traffic model, that the competent expert for traffic has identified as reliable for inclusion in an environmental assessment, and is referred to as the traffic reliability area" Source-DMRB – LA105 Air Quality.

For the quantitative appraisal emissions data from the traffic reliability area was included, this area is shown in Figure 2-2 below.

Figure 2-1 - Map showing baseline study area

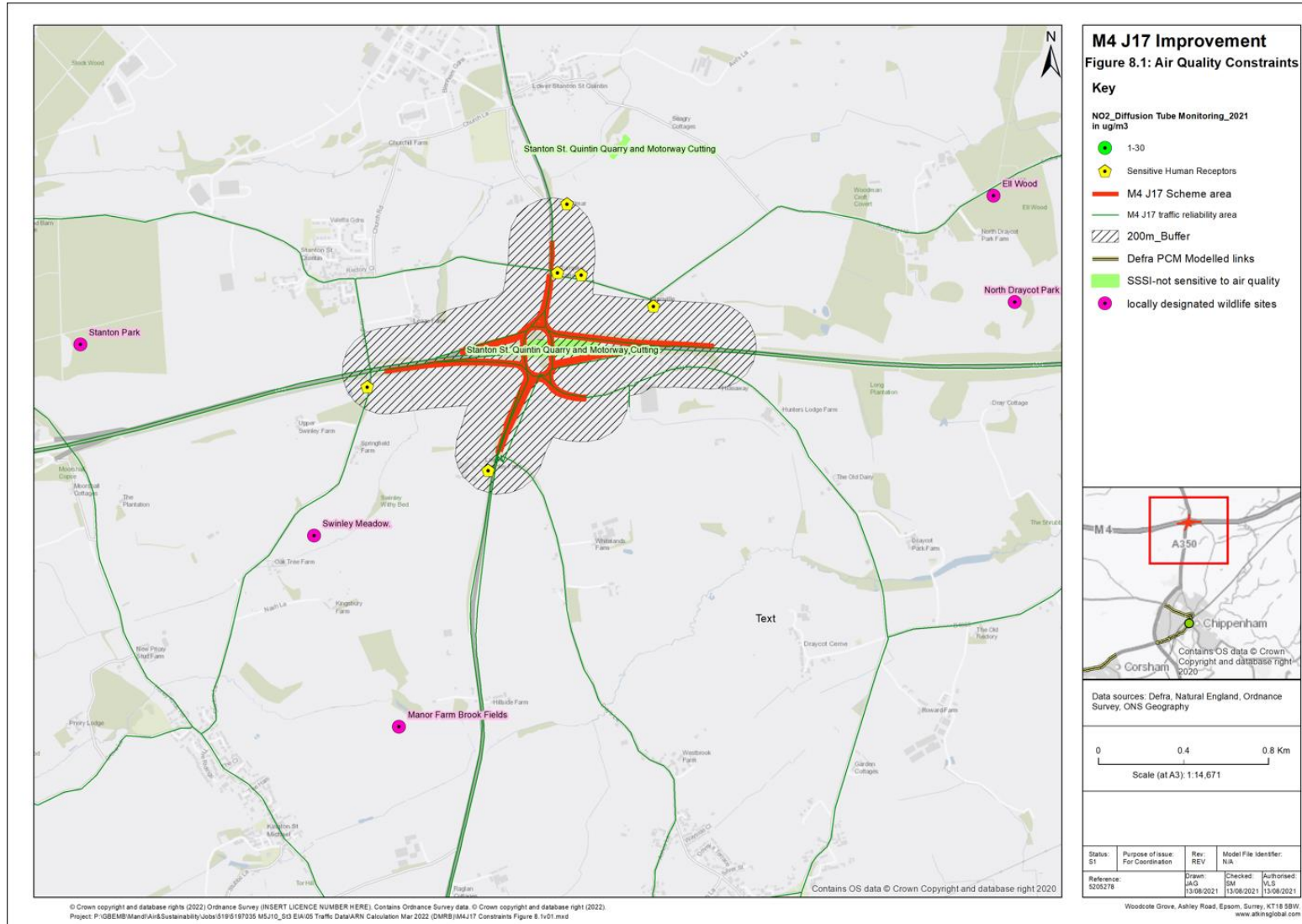
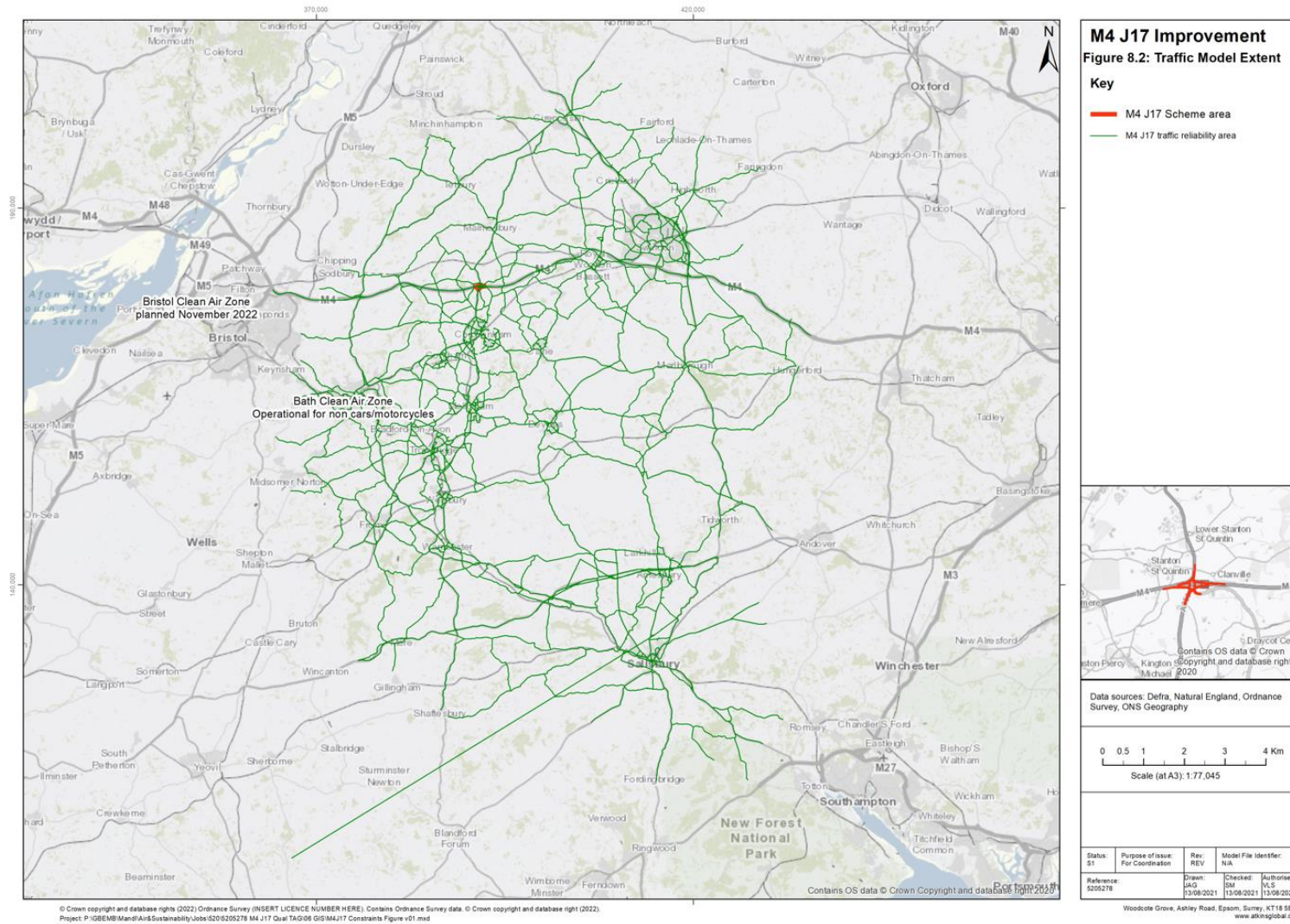


Figure 2-2 - Map showing traffic reliability area



2.1.3. Existing baseline knowledge

Information on existing ambient air quality i.e. baseline conditions, and identification of potential air quality constraints to the scheme have been determined through reference to the following sources:

- AQMA mapping⁴;
- Department for Environment, Food and Rural Affairs (DEFRA) Pollution Climate Mapping (PCM) model data for the latest available year (based on a reference year of 2018)⁵;
- Local Authority Local Air Quality Management (LAQM) Reports⁶;
- Ordnance Survey base mapping to identify locations of sensitive receptors (residential properties, schools, hospitals and planned and committed developments); and
- Designated habitat site information from Magic GIS⁷ and APIS⁸ and Wiltshire Council.

2.1.4. Baseline information

The scheme is within the Wiltshire Council boundary (WC).

A constraints map for the Scheme air quality study area is shown in Figure 2-1 above. The figure shows the Scheme boundary, boundaries of AQMA, relevant designated habitat sites, sensitive human receptors, PCM model data and closest local authority NO₂ diffusion tube monitoring data.

2.1.4.1. Air Quality Management Areas

The Scheme is located in an area of acceptable air quality, as it is not located within an Air Quality Management Area (AQMA). The nearest AQMA to the Scheme is located 11 km south east at Calne. There are also AQMAs in the wider area covered by the traffic reliability area including in Marlborough, Devizes, Bradford-on-Avon, Salisbury, Bath and Bristol.

2.1.4.2. Air quality monitoring

The nearest monitoring sites are located within the neighbouring towns of Chippenham and Calne, these sites represent urban roadside conditions and do not reflect the rural motorway conditions surrounding the Scheme. For reference, the nearest monitoring site is Site 24, 6 km south of the junction, situated on Rowden Hill in central Chippenham (391712,173286). Roadside concentrations of nitrogen dioxide at this site have been below the national annual mean air quality objective of 40 µg/m³ since 2017.

2.1.4.3. Clean Air Zones

There is one operational clean air zone within the traffic reliability area covering the Bath city area which is a class C clean air zone, for which charges apply to buses, coaches, taxis, private hire vehicles, heavy goods vehicles, vans and minibuses that do not meet the emission standards. A Clean Air Zone is planned for Bristol which will be operational from November 2022, which additionally will apply to cars not meeting the relevant emission standards.

2.1.4.4. Sensitive human health receptors

There are six sensitive human health receptors within 200 m of the Scheme. North of the M4 there are four properties: Hilmar off the A429 in Lower Stanton St Quintin; Turnpike Cottage (within 50 m of the Scheme) and the neighbouring property off Scotland Hill and one property at Clanville off Scotland Hill. South of the M4 there

⁴ Department for Environment, Food and Rural Affairs, "Information on AQMAs" [Online]. Available: <http://uk-air.defra.gov.uk/aqma/maps> . [Accessed August 2021]

⁵ Department for Environment, Food and Rural Affairs, "PCM Model Data" [Online], Available at: <https://uk-air.defra.gov.uk/data/gis-mapping>. [Accessed August 2021]

⁶Wiltshire Council – 2021 Air Quality Annual Status Report (ASR), July 2021 [online] Available at: <https://www.wiltshireairquality.org.uk/assets/documents/council-reports/ASR%20Final%2013.07.2021.pdf> [Accessed August 2021].

⁷ Department for Environment, Food and Rural Affairs, "Magic", [Online], Available at: <https://magic.defra.gov.uk/MagicMap.aspx>, [Accessed August 2021]

⁸ Air Pollution Information System (APIS), [Online], Available at: <http://www.apis.ac.uk/>, [Accessed August 2021]

is one property on Stanton Lane, and one at Lower Swinley Farm off the A350, 60 m from the A350 southbound exit from Junction 17 on the M4.

2.1.4.5. Designated habitat receptors

The Stanton St. Quintin Quarry and Motorway Cutting Site of Special Scientific Interest (SSSI) located within the Scheme extent is designated for its exposure of rock formations and is not sensitive to nitrogen.

There are five non statutory designated habitats identified within 2 km of the Scheme, presented in Figure 2-1 above. None of these are located within 200 m of the Scheme.

2.1.4.6. Baseline Summary

There are no AQMA within 200 m of the Scheme extent. There are no monitoring sites within 2 km of the Scheme. There is only one property within 50 m of the Scheme with a further five found within 100 - 200 m of the Scheme. There are no designated habitats within 200 m of the Scheme extent. Within the wider traffic reliability area, there is one Clean Air Zone in operation around the city of Bath, with another planned in Bristol, and a number of AQMAs.

2.1.5. Appraisal results

The change in NO_x and PM₁₀ emissions as a result of the Scheme was calculated in the opening (2026) and forecast (2036) years. The annual vehicle km was calculated by combining the AADT 24 hour traffic flow by the link length for each link, and then multiplying by 365 to represent the number of days in the year. The change is between 0.02% and 0.03% of the total Do-Minimum (DM) emissions in 2026 and 0.03% and 0.05% of the total DM emissions in 2036 and reflects the change in vehicle km in each year, presented in Table 2-1.

Table 2-1 - Emissions changes across the traffic reliability area

Opening year (2026)	NO _x emissions (kg/yr)	PM ₁₀ emissions (kg/yr)	Annual vehicle km
DM	1,690,315	262,514	9,237,512,003
DS	1,690,569	262,594	9,241,269,130
Change	+255	+80	+3,757,126
% change v DM	+0.02%	+0.03%	+0.04%
Design year (2036)			
DM	1,144,508	298,606	10,921,520,570
DS	1,144,812	298,750	10,928,210,692
Change	+305	+144	+6,690,122
% change v DM	+0.03%	+0.05%	+0.06%

DM – Do-Minimum

DS – Do-Something

The TAG air quality valuation is shown in Table 2-2.

Table 2-2 - TAG Appraisal- Air quality valuation

Methodology	Results
Appraisal (WebTAG)	Change in NOx emissions over 60 years (NOx tonnes) +18
	Change in PM₁₀ emissions over 60 years (PM₁₀ tonnes) +8
	Monetary £(NPV) -£405,707

The change in NOx emissions over 60 years is 18 tonnes and the change in PM₁₀ emissions is 8 tonnes. This reflects the increase in traffic movements across the model area with the Scheme which is less than 0.1% of the total DM traffic movements. The results of the TAG assessment show that over the 60 year period the valuation of the increase in emissions is a damage cost of £ 0.3 million.

2.2. Greenhouse Gases

2.2.1. Baseline

Greenhouse gas (GHG) emissions in the atmosphere absorb the sun's radiation, preventing it from escaping into space, a term known as global warming. The higher the concentration of GHGs the more the heat energy is retained, and the higher global temperatures become. Due to human activities, the concentration of GHGs in the atmosphere has increased dramatically, with carbon dioxide (CO₂) concentrations now exceeding 400 parts per million. This leads to a myriad of indirect impacts as the climate responds to the increased atmospheric temperature.

To support international efforts to reduce GHG emissions, the UK Climate Change Act, as amended in 2019, set a legal reduction target of at least 100% reduction in net emissions against 1990 levels, i.e. a target of 'net zero'. UK carbon budgets over 5 year periods, which act as interim carbon reduction targets, have so far been set to 2037. The UK's provisional territorial GHG emissions were 424.5 million tonnes CO₂ equivalent (CO₂e) in 2021, 47.3% lower than in 1990. Transport is the sector accounting for the largest proportion of UK emissions, of which road transport is the largest contributor. Overall emissions from the transport sector have changed relatively little since the 1990 baseline, with a decline of just 6% in 2019.

2.2.2. Appraisal methodology

Changes in greenhouse gas emissions were assessed following the guidance presented in TAG Unit A3 section 4. The traffic data and emissions data prepared for the air quality study area were also used to calculate total emissions of CO₂ with and without the Scheme. The national highways air quality spreadsheet model v9, based on Defra vehicle emission factor toolkit (EFT v11.0) was used to calculate regional emissions.

The change in CO₂ emissions as a result of the Scheme was calculated in the opening (2026) and forecast (2036) years. It was assumed that emissions of CO₂ would change incrementally between these two years and would remain unchanged post 2036 for the remainder of the 60 year appraisal period.

2.2.3. Appraisal results

The change in CO₂ emissions as a result of the Scheme was calculated in the opening (2026) and forecast (2036) years. The annual vehicle km was calculated by combining the AADT 24 hour traffic flow by the link length for each link and then multiplying by 365 to represent the number of days in a year. The change with the Scheme is shown to be an increase of 0.02% in both direct vehicle emissions associated electric vehicle emissions in 2026, and 0.04% in direct vehicle emissions and 0.05% in associated electric vehicle emissions in 2036 and reflects the increase in vehicle km in each year, presented in

Table 2-3.

Table 2-3 – CO₂ Emissions changes across the traffic reliability area

Opening year (2026)	CO ₂ -non-traded road user emissions(t/yr)	CO ₂ -traded electric vehicle emissions (t/yr)	Annual vehicle km
DM	1,620,060	10,838	9,237,512,003
DS	1,620,379	10,840	9,241,269,130
Change	+320	+2	+3,757,126
% change v DM	+0.02%	+0.02%	+0.04%
Design year (2036)			
DM	1,426,132	19,851	10,921,520,570
DS	1,426,715	19,861	10,928,210,692
Change	+583	+10	+6,690,122
% change v DM	+0.04%	+0.05%	+0.06%
DM – Do-Minimum DS – Do-Something			

The TAG greenhouse gases valuation is shown in Table 3-2.

Table 2-4 - TAG Appraisal - Greenhouse gases valuation

Methodology	Results
Appraisal (WebTAG)	<p>Change in non-traded road user carbon dioxide over 60 years (CO₂ tonnes) +33,286</p> <p>Change in traded electric vehicle carbon dioxide over 60 years (CO₂ tonnes) +557</p> <p>Monetary £(NPV) -£2,458,042</p>

The results of the TAG assessment show that over the 60 year period there would be an increase in traded and non traded CO₂ emissions, (+33,286 tonnes in non traded direct vehicle emissions and +557 tonnes in traded sector associated with electric vehicle use on the road network) with a commensurate damage cost of £ 2.5 million.

2.3. Noise and Vibration

2.3.1. Appraisal methodology

This appraisal has been carried out in accordance with TAG appraisal methodology. TAG appraisal methodology involves the quantification of noise impacts associated with only the operation of road projects. Therefore, construction noise and vibration have not been considered in this appraisal.

The operational noise study area and operational noise impacts have been established based upon the Design Manual for Roads and Bridges LA 111 'noise and vibration', revision 2, May 2020 (DMRB LA 111). Road traffic noise levels have been determined using a noise model built in NoiseMap v5.2. The noise model includes 259 receptors within the operational noise study area. NoiseMap incorporates the prediction methodology set out in the Calculation of Road Traffic Noise (CRTN). Night-time road traffic noise levels have been calculated using

'Method 3' from the Transport Research Laboratory (TRL) report 'Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping'.

2.3.1.1. Scoping

DMRB LA 111 contains four scoping assessment questions and if the response to one or more of these is 'yes' then a further assessment is recommended. One of these questions is:

"is the project likely to cause a change in the basic noise level (BNL) of 1dB $L_{A10,18hr}$ in the do-minimum opening year (DMOY) compared to the do-something opening year (DSOY)?" (i.e., the opening year)"

According to the analysis of traffic data, the Scheme is likely to cause a change in the BNL of 1dB $L_{A10,18hr}$ in the opening year. Therefore, a further operational noise assessment is required.

2.3.1.2. Operational study area

The operational study area for this appraisal has been defined in accordance with DMRB LA 111 as follows:

- The area within 600 m of new road links or road links physically changed or bypassed by the project; and,
- The area within 50 m of other road links with the potential to experience a short-term BNL of more than 1dB $L_{A10,18hr}$.

The road links expected to be physically changed by the project are the lane widenings proposed at M4 J17. As stated above, the Scheme is likely to cause a change in the BNL of 1dB $L_{A10,18hr}$ in the opening year. These BNL changes are expected to occur on the following sections of road:

1. Cromhall Lane/Easton Piercy Lane/Grove Lane/Stanton Lane between Kent's Bottom and Kington St Michael
2. Seagry Road between Sutton Benger and Upper Seagry
3. A350 northbound between Day's Lane and the gyratory junction at Junction 17
4. A429 southbound within 80 metres of the gyratory junction at Junction 17

Road sections 3 and 4 above are where the number of lanes is proposed to be increased due to the Scheme. Sections 1 and 2 are further away from M4 J17 and are due to the traffic re-routing expected to be brought about by the Scheme. Due to these changes in the opening year BNL, an operational noise assessment, and subsequent quantitative assessment using the TAG Noise Workbook, have been undertaken. However, it is important to note that the appraisal herein is proportionately indicative at this stage and does not consider complexities such as the local terrain.

2.3.1.3. Methodology, assumptions and limitations

The traffic data used for the assessment of operational noise has been provided by the Atkins transport team on 23 June 2022. The traffic data was provided both with and without the Scheme, for the opening year 2024 and the future year 2036. It is understood that the opening year of the Scheme is 2026. Therefore, the 2024 traffic data has been used as a proxy for the 2026 traffic data.

DMRB LA 111 requires that road traffic noise levels are predicted and assessed for the following four scenarios:

- DMOY
- DSOY
- Do-Minimum Future Year (DMFY)
- Do-Something Future Year (DSFY)

The traffic model, in particular the traffic flows, traffic composition, and average speed on each link, has been used to determine the noise level for each of these four scenarios. For each of the receptors in the operational study area the predicted noise levels were then used to determine the short and long-term changes in noise due to the Scheme, as follows:

- DMFY minus DMOY: This presents the long-term change in road traffic noise without the Scheme
- DSOY minus DMOY: This presents the short-term change in road traffic noise upon opening of the Scheme
- DSFY minus DMOY: This presents the long-term change in road traffic noise with the Scheme

For each of the three comparisons described above, the number of receptors within the operational study area that are subject to no change, negligible, minor, moderate, or major magnitude of impact (that may be either increases or decreases) are reported in section 2.3.2 below.

For a 1dB change to occur traffic flows need to increase by 25% or decrease by 20% (all other variables being equal). Therefore, small errors in traffic flow forecasts are unlikely to significantly affect results.

This assessment has been undertaken in the absence of topography data. Therefore, the findings of this assessment assume that the ground is flat for the entirety the operational study area. The local topography will affect noise propagation, and therefore the findings of this appraisal should be taken as indicative only. Furthermore, only noise-sensitive receptors located within buildings have been considered. That is, outdoor non-residential receptors such as PRoW, church cemeteries and SSSI have been excluded from this appraisal.

2.3.1.4. Receptors within the operational study area

Within the operational noise study area, a total of 259 noise sensitive receptors have been identified. These include 16 non-residential noise sensitive receptors, such as:

- A church
- A primary school
- A war memorial
- 10 offices
- Three holiday cottages

Further noise sensitive receptors identified within the operational noise study area include designated areas. These are two Noise Important Areas⁹ (NIA), identified on the A350 and close to the M4:

- IA_ID: 3872, asset owner National Highways
- IA_ID: 3724, asset owner Wiltshire Council

2.3.2. Appraisal results

An assessment of operational noise has been carried out for 259 noise-sensitive receptors within the operational study area of the Scheme. The tables below present the predicted operational impacts over the short-term and long-term and are based on tables 3.55a and 3.55b in DMRB LA 111. Since negligible changes in road traffic noise are not typically expected to alter behaviour or responses to noise the discussion of impacts has been limited to minor/moderate/major impacts only.

Noise changes over the long-term without the Scheme (DMFY versus DMOY)

Table 2-5 below compares the “non-project noise change” (i.e., DMOY scenario with the DMFY scenario).

⁹ These are areas identified by Defra where 1% of the population are affected by the highest noise levels from major roads are located according to the strategic noise mapping undertaken by Defra under the terms of the Environmental Noise (England) Regulations 2006, as amended.

Table 2-5 - Summary of long-term changes, without the Scheme

Scenario/Comparison: DMOY 2026 versus DMFY 2036

Change in noise level dB(A)		Magnitude of impact	Number of receptors	
			Daytime	Night-time
Increase in noise level, $L_{A10,18h} / L_{night}$	<3.0	Negligible	259	259
	3.0 - 4.9	Minor	0	0
	5.0 - 9.9	Moderate	0	0
	≥ 10	Major	0	0
No Change	= 0	No Change	0	0
Decrease in noise level, $L_{A10,18h} / L_{night}$	<3.0	Negligible	0	0
	3.0 - 4.9	Minor	0	0
	5.0 - 9.9	Moderate	0	0
	≥ 10	Major	0	0

The changes in road traffic noise level shown in Table 2-5 occur over the long-term without the Scheme and result from changes in traffic volume and traffic speed on the existing road network. Without the Scheme, all receptors are predicted to experience negligible change in road traffic noise level.

Noise changes due to the Scheme upon opening (DSOY versus DMOY)

Table 2-6 below compares road traffic noise levels due to the Scheme in the opening year (i.e., DSOY scenario with the DMOY scenario). The changes in road traffic noise shown in Table 2-6 are due to the Scheme over the short-term and result from changes in traffic flows and speeds on the existing network, as well as the proposed changes at M4 J17.

Table 2-6 - Summary of short-term noise changes, with the Scheme

Scenario/Comparison: DMOY 2026 versus DSOY 2026

Change in noise level dB(A)		Magnitude of impact	Number of receptors	
			Daytime	Night-time
Increase in noise level, $L_{A10,18h} / L_{night}$	<1.0	Negligible	44	44
	1.0 - 2.9	Minor	0	0
	3.0 - 4.9	Moderate	0	0
	≥ 5	Major	0	0
No Change	= 0	No Change	0	0
Decrease in noise level, $L_{A10,18h} / L_{night}$	<1.0	Negligible	144	147
	1.0 - 2.9	Minor	71	68
	3.0 - 4.9	Moderate	0	0
	≥ 5	Major	0	0

Table 2-6 demonstrates that most receptors will experience a negligible change in road traffic noise level over the short-term because of the Scheme.

Beneficial impacts due to the Scheme upon opening

Beneficial impacts are predicted in the short term upon opening of the Scheme due to changes brought about by the increase in the number of lanes at M4 J17. There are seventy-one receptors that are expected to have a minor beneficial impact due to the Scheme over the short-term during the daytime. These receptors are in the villages of Kington St Michael, Sutton Bengier and Upper Seagry with further receptors located on Cromhall Lane. These minor beneficial changes are due the additional capacity at M4 J17 effectively drawing traffic away from the smaller roads onto the A350 and A429.

Adverse impacts due to the Scheme upon opening

No receptors are predicted to experience minor, moderate or major adverse impacts due to the Scheme in the short-term.

Noise changes over the long-term with the Scheme

(DSFY versus DMOY)

Table 2-7 below compares the long-term noise changes due to the Scheme (i.e., the DSFY scenario with the DMOY scenario). The changes in road traffic noise due to the Scheme over the long-term are due to changes in traffic flows and speeds, as well as the increase in the number of lanes at M4 J17.

Table 2-7 - Summary of long-term noise changes, with the Scheme

Scenario/comparison: DMOY 2026 versus DSFY 2036

Change in noise level dB(A)		Magnitude of impact	Number of receptors	
			Daytime	Night-time
Increase in noise level, $L_{A10,18h} / L_{night}$	<3.0	Negligible	179	180
	3.0 - 4.9	Minor	0	0
	5.0 - 9.9	Moderate	0	0
	>=10	Major	0	0
No Change	= 0	No Change	0	0
Decrease in noise level, $L_{A10,18h} / L_{night}$	<3.0	Negligible	80	79
	3.0 - 4.9	Minor	0	0
	5.0 - 9.9	Moderate	0	0
	>=10	Major	0	0

Table 2-7 demonstrates that, within the study area, most receptors are predicted to experience a negligible noise change due to the Scheme over the long-term.

Beneficial impacts due to the Scheme over the long term

No receptors are predicted to experience minor, moderate, or major beneficial impacts due to the Scheme over the long-term.

Adverse impacts due to the Proposed Scheme over the long term

No receptors are predicted to experience minor, moderate or major adverse impacts due to the Scheme over the long-term.

Determination of significance

According to LA 111, a minor beneficial impact upon opening is significant provided that:

- DMRB SOAEL (i.e., 68 dB $L_{A10,18h}$ façade) is exceeded during one of the do-something scenarios or,
- the magnitude of change is greater over the long-term compared to the short-term.

DMRB SOAEL is exceeded at four of the receptors expected to have a minor beneficial impact upon opening. Therefore, this short-term beneficial effect is considered significant at the following four receptors:

- 1b, Laurel Cottage, Seagry Road, Wiltshire, SN15 4RY
- 3 Willowbrook End, Wiltshire, SN15 4SW
- Hazelwood Farmhouse, Seagry Hill, Wiltshire, SN15 4SA
- 5 Seales Gate, Coach House, Upper Seagry, SN15 5EY

The remaining sixty-seven short-term minor beneficial changes become negligible over the long-term, therefore their initial beneficial impact is insignificant overall.

NIA 3724 includes the following property, Hill View, A350 Tor Hill, Wiltshire, SN14 6BJ. At this property, the predicted noise level with the Scheme in place exceeds the SOAEL threshold. The Scheme is expected to reduce the noise level at this property by a negligible amount (-0.8 dB $L_{A10,18h}$) in the opening year. According to DMRB LA 111, this negligible reduction in road traffic noise is insignificant.

No noise sensitive receptors within NIA 3872 fall within the boundary of the study area associated with the Scheme.

Monetised impacts of noise

A monetary valuation of noise changes using the TAG Noise Workbook has been undertaken and indicates that the Scheme results in an approximate net present value of change in noise of £229,021 (i.e. a net benefit). The net present value of change in noise and the associated health effects are presented in Table 2-8 below.

Table 2-8 - Net present value of change in noise breakdown

Sleep disturbance	£110,351
Amenity	£78,456
Acute myocardial infarction (AMI)	£24,836
Stroke	£6,135
Dementia	£9,244
Net present value of change in noise (total)	£229,021

Conclusion

The predicted noise changes due to the Scheme at most noise-sensitive receptors within the operational study area are predicted to be negligible over the short-term. Over the long-term, changes in road traffic noise are expected to be negligible at all receptors. Seventy-one receptors are expected to have a minor beneficial impact due to the Scheme over the short-term during the daytime. These minor beneficial impacts are due to traffic re-routing brought about by increased capacity at M4 J17. The predicted noise level exceeds the SOAEL threshold at four of the seventy-one receptors, leading to a significant improvement in noise at four properties on Seagry Road. The minor beneficial effect at all other properties is not considered significant. The findings of a TAG noise appraisal indicate a positive net benefit in terms of health effects due to the Scheme.

2.4. Biodiversity

2.4.1. Appraisal methodology

The biodiversity WebTAG was composed based on guidance provided in the DfT (May 2021) TAG UNIT A3: Environmental Impact Appraisal document. The data contributing to the biodiversity WebTAG was collated using

the Preliminary Ecological Appraisal Report produced by Atkins Limited in January 2021 on behalf of Wiltshire Council, as well as the Wiltshire Biodiversity Action Plan (2008) produced by Wiltshire Wildlife Trust.

2.4.2. Appraisal results

The Scheme is located within a SSSI and is within 2 km of five Local Wildlife Sites. It is also within 15 km of a Special Area of Conservation (SAC) with bats listed as a qualifying feature. Habitats within the Scheme area include three UK Biodiversity Action Plan priority habitats of local value (semi-natural broadleaved woodland, species-poor hedgerow and species-poor hedgerow with trees), as well as other common and widespread habitats. Potential notable species which the site may support include bats, reptiles, hazel dormouse, great crested newt, badger and nesting birds.

The overall WebTAG assessment score is **slight adverse** due to the loss of a small area of non-priority habitat which has low biodiversity and earth heritage value. The poor quality of this habitat means it could be argued that the overall score is 'Neutral'. However, it is also possible that future surveys may identify populations of notable species due to the suitability of the Scheme as a potential habitat. This would change the receptor value to 'Medium' or 'High'. Despite this, as long as appropriate mitigation is provided, this would still result in an overall score of 'Slight Adverse'.

Suitable mitigation may mean adopting a Precautionary Method of Working for the given species, ensuring direct and incidental impacts are minimised where possible. This may include conducting further surveys, conducting pre-works checks, avoiding scrub removal, avoiding damage to nearby water bodies, reducing noise pollution and other forms of disturbance, and/ or creating suitable habitats elsewhere to remediate displacement of protected species.

2.5. Water Environment

2.5.1. Appraisal methodology

Chapter 10 from TAG Unit A3 has been used as the appraisal framework to establish potential impacts on the water environment, which includes impacts on water quality (surface water and groundwater), flood risk, groundwater levels and flows and hydromorphology.

The approach used is as follows:

- Key environmental resources were identified using publicly and readily available data. The key environmental resource features, indicators of quality and possible measures of quality are identified using Table 13 from Chapter 10 of the TAG.
- The value or importance of the key water environmental resources was assessed by analysing their features. The indicators used to make a judgement on the value or importance of a feature include quality, scale, rarity, and substitutability. An importance for each feature is derived using Table 14 from Chapter 10 of the TAG as guidance.
- A magnitude of impact was then determined by appraising the effects predicted for each feature. Table 15 from Chapter 10 of the TAG provides guidance on the magnitude criteria for potential impacts, with some examples.
- The appraisal of the importance of the features was combined with the appraisal of the magnitude of the impacts, to determine the consequences of those impacts. Table 16 from Chapter 10 of the TAG provides guidance for determining the significance of a potential impact based on its magnitude and the importance of the feature.
- The assessment of each feature was combined into an assessment score for each key water environment resource. This is based on the definitions given in Table 17 from Chapter 10 of the TAG.
- The overall assessment score for the Scheme was determined according to the most adverse assessment of the key environmental resources affected.

2.5.2. Appraisal results

The appraisal shows the Scheme will potentially impact the water environment, more specifically water quality (potentially surface water and groundwater), flood risk and hydromorphology. No impacts on groundwater levels and flows have been identified at this stage of the assessment but may become apparent as Scheme design progresses. Without mitigation the overall assessment score for the operation of the Scheme is large adverse. This score is a result of the potential increase in flood risk. However, applying mitigation including sustainable drainage measures that attenuate runoff volumes and remove suspended solids and dissolved pollutants, embedding flood compensation storage into the design and ensuring any culvert modifications follow environmentally sensitive culvert design standards, including the potential for enhancements up and downstream where practicable, will reduce the overall water environment assessment score to **Neutral**.

When specific quantitative data becomes available (e.g. drainage catchment areas and traffic data) the impacts of the Scheme on water quality should be re-assessed using the Design Manual for Roads and Bridges (DMRB) LA 113¹⁰ methodology.

A Flood Risk Assessment (FRA) should also be produced in accordance with the requirements of the Overseeing Organisation. The FRA shall use the latest climate change allowances published by the relevant authority. If the Scheme does encroach into Flood Zones 2 or 3 then floodplain storage compensation will be required. The compensation storage must be provided on a level for level volume basis and hydraulically linked to the watercourse as close to the area of loss as possible.

If works are required to the existing culvert on Rodbourne Brook then a Flood Risk Activity Permit from the Environment Agency may be required.

A Water Framework Directive (WFD) Compliance Assessment should also be undertaken to demonstrate that the Swill not result in a deterioration in status (or potential) of any waterbody, or prevent the waterbody from meeting good status (or potential) in the future. Guidance set out in DMRB LA 113 outlines the basis for the WFD Compliance Assessment.

2.6. Landscape

2.6.1. Appraisal methodology

The study area for the Scheme has been defined as the footprint of the Scheme area, plus a 2 km buffer zone. This assesses the landscape character and visual impact. The study area extent was established by professional judgement and relevant guidance as noted below.

Due to the scale, type of scheme and stage of work, these extents are considered adequate at this stage, to identify where the Scheme may have impacts. This could result in significant effects on landscape character or visual amenity, as the Scheme and assessment progress, this area may be amended.

This assessment has been undertaken to a proportionate level of detail (for example, assessing groups of residential properties rather than individually), in line with the current assessment stage of the Scheme.

This preliminary landscape and visual amenity assessment follows the principles of the guidelines produced by relevant professional bodies concerned with transport-related schemes and landscape and visual impact assessment. The guidance includes:

- DMRB LA 107¹¹ and DMRB LA 104¹²;
- Landscape Character Assessment Guidance for England and Scotland prepared jointly by the Countryside Agency and Scottish Natural Heritage, 2002; and
- Landscape and visual effects and the Landscape Institute's Guidelines for Landscape and Visual Impact Assessment Third Edition (GLVIA 3).

The following sources were consulted to establish the baseline data:

¹⁰ Highways England, March 2020, Design Manual for Roads and Bridges, LA 113 Road drainage and the water environment.

¹¹ Highways England, February 2020, Design Manual for Roads and Bridges, LA 107 Landscape and Visual Effects.

¹² Highways England, August 2020, Design Manual for Roads and Bridges, LA 104 Environmental assessment and monitoring.

- National Character Area 117: Avon Vales¹³;
- Wiltshire GIS data¹⁴;
- Woodland Trust – Ancient Tree Inventory;
- Natural England GIS Data;
- English Heritage GIS Data;
- Sustrans GIS Data;
- OS Open Data;
- Google Earth; and
- Google ‘Streetview’.

2.6.2. Appraisal results

The proposed widening of the M4 Junction 17 has the potential to result in direct adverse effects in the short term. However, there are opportunities to embed environmental mitigation and enhancement measures in the Scheme design to avoid, minimise and offset these effects as the environmental design and mitigation strategy is developed. The overall effect would be **Slight Adverse**.

2.7. Townscape

Due to the rural surroundings of the M4 Junction 17, a Townscape assessment has been scoped out of the WebTAG appraisal.

2.8. Historic Environment

2.8.1. Appraisal methodology

The approach for the WebTAG was adopted from DMRB. The appraisal follows the methodology set out and summarised in TAG Unit A3.

The designated heritage assets and non-designated heritage assets (receptors) were identified using the following sources:

- Historic England’s National Heritage List of England (NHLE) for designated heritage assets;
- Heritage Gateway for non-designated heritage assets and historic landscape character;
- Google Earth for aerial imagery of designated heritage assets and non-designated heritage assets; and
- Historic Mapping for non-designated heritage assets.

Professional judgement, based on the existing baseline, has been used to assess the mitigation strategy.

2.8.2. Appraisal results

The construction of the Scheme would result in no permanent moderate adverse impacts on heritage assets in the vicinity of the M4 Junction 17. The improvements to the junction would result in no adverse impacts due to these works being carried out on existing junction and roads where any archaeological remains have already been identified by survey works or truncated/disturbed by previous construction activity. The operation of the Scheme would result in no adverse impacts on the settings of designated heritage assets. The overall effect would be **Neutral**.

¹³ Natural England, January 2014

¹⁴ <https://wiltscouncil.maps.arcgis.com/apps/webappviewer/index.html>

2.9. Geology and Soils

2.9.1. Appraisal Methodology

This section sets out the proposed scope for the geology and soils assessment which will be undertaken in accordance with the methodology set out in DMRB LA 109¹⁵.

2.9.1.1. Study area

To consider the effects associated with land contamination, the study area will include the Scheme footprint within the Scheme boundary (the Site) and land immediately beyond it to a distance of 500 m (off-site). This is considered appropriate for identifying historical and current potentially contaminative land uses which may have resulted in contamination within the Scheme and the location of sensitive off-site receptors which may be affected by the Scheme.

The study area to consider effects on geology and soil resources will be the permanent engineering footprint of the Scheme, including associated embankment and slip-roads. The extent of temporary land acquisition for construction cannot be assessed at this stage, as such locations are unknown.

2.9.2. Baseline

A preliminary baseline assessment has been completed here with reference to freely available resources.

The site is located at Junction 17 of the M4 at the intersection with the A429 to the north, and the A350 and B4122 to the south and encompasses the eastbound and westbound slipway approaches and central gyratory.

Considering the presence of the current road network, it is likely that Made Ground would be present on the site associated with the road construction; this may comprise reworked natural material or imported fill of unknown provenance which has the potential to contain a range of contaminants and asbestos.

With reference to the British Geological Survey published mapping¹⁶, superficial deposits are absent from the site. The site is underlain by bedrock geology comprising mudstone of the Kellaways Clay Member and limestone of the Cornbrash Formation. The Kellaways Clay underlies the majority of the site. The Cornbrash Formation underlies the central section of the site, predominantly underlying and immediately surrounding the existing M5 carriageway, and is also located at the far south of the site A350 and B4122 join the gyratory.

The Cornbrash Formation, where it is exposed in cuttings at the site, is designated as a geological SSSI.

With reference to DEFRA's MAGIC GIS database¹⁷, the Kellaway's Clay is classified as an unproductive stratum and the Cornbrash Formation is classified as a Secondary A Aquifer. The entire site is situated within Zone 2c of a groundwater source protection zone (SPZ) related to a potable water abstraction approximately 4.3 km to the north-east of the site. Zone 1c of the SPZ is located approximately 580 m to the north of the site. Zone 2c identifies the aquifer as confined and is defined as the outer zone the catchment area with a 400 day travel time to the source abstraction. Zone 1c and identified the inner zone of the confined aquifer with a 50 day travel time to the source abstraction.

There is no agricultural land on site in its current layout or within the proposed site extents. Agricultural land is located adjacent to the site.

2.9.2.1. Potential sources and receptors to contamination

Potential contamination sources have been identified related to construction and operation of the existing road network including Made Ground of unknown provenance and spill, leaks and potentially contaminated surface water run-off.

Sensitive receptors include human health receptors (on-site operatives and maintenance workers); controlled waters receptors (groundwater in the underlying secondary A aquifer and SPZ); property receptors (on-site and off-site services and structures); and the on-site geological SSSI.

¹⁵ Highways England, October 2019, Design Manual for Roads and Bridges, LA 109 Geology and Soils.

¹⁶ Opengeoscience: Onshore Geindex (2021) <https://www.bgs.ac.uk/opengeoscience>

¹⁷ <https://magic.defra.gov.uk>

2.9.3. Appraisal results

Review of preliminary baseline data as summarised above indicates that there are potential land contamination sources on site and potential sensitive receptors.

The construction phase could potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination. Construction activities, such as excavation, trenching and piling may introduce new pathways for migration of existing contamination and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off and ground gas migration. Construction activities may also physically impact or disturb geological features.

Environmental impacts are likely to be greatest during construction, with reduced impacts likely during operation. The Scheme may also generate limited waste soils during operation due to maintenance requirements which may include excavations for landscaping, repairs and maintenance of services.

Mitigation measures to minimise potential impacts would include:

- Design of the proposed development in accordance with statutory guidance and best practice;
- Assessment of the ground conditions and incorporation of mitigation/remedial measures to reduce risks associated with land contamination if required;
- Assessment of the potential UXO risk at the site;
- Implementation of appropriate pollution incident control and implementation of appropriate and safe storage of fuel, oils and equipment during construction;
- Management of earthworks in accordance with relevant legislation to allow the re-use of suitable soils, where appropriate;
- Design the proposed development and manage earthworks to avoid or where not possible, minimise physical impacts on designated geological features; and
- Operation of the development in accordance with the relevant regulations, best practice guidance and pollution prevention.

Considering the condition at operation will be equivalent to the baseline, with the implementation of the mitigation measures, the proposed development is unlikely to result in any significant effects in relation to land contamination.

2.9.3.1. Next steps

The following work stages are anticipated to be required:

- A desk study will be completed for the Scheme and will be used to inform the baseline information for the environmental assessment. As part of the desk study, a Preliminary Conceptual Site Model will be developed.
- A ground investigation and collection of geo-environmental laboratory data may also be required to support further assessment, dependant of the findings of the desk study.

Appendices



Appendix A. Air Quality WebTAG Worksheet

Air Quality WebTAG Worksheet in pdf format provided below. For the full worksheet, please refer to documents reference ([WC M4J17-ATK-EAQ-XX-RP-LA-000003](#))

Air Quality Valuation Workbook - Worksheet 3

Scheme Name: M4 J17 improvements

Present Value Base Year:

Current Year:

Proposal Opening year:

Project (Road/Rail or Road and Rail):

Overall Assessment Score:

Damage Costs Approach (Emissions)

Present value of change in NOx emissions (£):

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

OR

Present value of change in PM10 emissions (£):

Impact Pathways Approach (Concentrations)

Present value of change in NO2 concentrations (£):

Of which:

Concentration costs:

Other impacts:

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

Of which:

Concentration costs:

Other impacts:

Total Change

Total value of change in air quality (£):

*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)

Change in PM2.5 assessment scores over 60 year appraisal period:
(between 'with scheme' and 'without scheme' scenarios)

Damage Costs Approach (Emissions)

Change in NOx emissions over 60 year appraisal period (tonnes):
(between 'with scheme' and 'without scheme' scenarios)

Change in PM2.5 emissions over 60 year appraisal period (tonnes):
(between 'with scheme' and 'without scheme' scenarios)

OR

Change in PM10 emissions over 60 year appraisal period (tonnes):
(between 'with scheme' and 'without scheme' scenarios)

Qualitative Comments:

Increase in NOx and PM10 emissions over the 60 year appraisal period, due to overall increase in vehicle kilometres with the scheme in place.

Sensitivity Analysis:

Upper estimate net present value of change in air quality (£):

Lower estimate net present value of change in air quality (£):

Data Sources:

TAG Unit A3 Environmental Impact Appraisal, May 2022, Section 3 Air Quality Impacts.
 Traffic Data provided for opening year 2026 and future year 2036.
 Highways England speedband emissions factors (v9) based on Defra vehicle emission factor toolkit (EFT v11.0)
 NOx and PM10 emissions for 2026 and 2036 calculated within Traffic Reliability Area
 Beyond 2036 NOx and PM10 emissions assumed constant. 2036 emission factors used for future year emission calculations.

Appendix B. Greenhouse Gas WebTAG Worksheet

Greenhouse Gases WebTAG Worksheet in pdf format provided below. For the full worksheet, please refer to documents reference ([WC_M4J17-ATK-EAQ-XX-RP-LA-000004](#))

Greenhouse Gases Workbook - Worksheet 1

Scheme Name: M4 J17 improvements

Present Value Base Year

Current Year

Proposal Opening year:

Project (Road/Rail or Road and Rail):

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£):

*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)

Of which Traded

Change in carbon dioxide equivalent emissions in opening year (tonnes):
(between 'with scheme' and 'without scheme' scenarios)

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)

*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	4.609763078
Non-traded sector	0	0	0	665.840092

Qualitative Comments:

Assessment performed using GHG emissions calculation method (TAG Unit A3) not TUBA.
Tailpipe emissions from all vehicles are calculated within the Traffic Model Area for the Non-Traded Sector.
Non-exhaust CO2 equivalent (CO2e) emissions related to the charging of electric and plug-in hybrid vehicles forecast use within the Traffic Model Area reported in Traded Sector.

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£):

Data Sources:

TAG Unit A3 Environmental Impact Appraisal, May 2022, Section 4 Greenhouse Gases
Traffic Data provided for opening year 2026 and the forecast year 2036.
Carbon dioxide emissions for 2026 to 2036 based on linear interpolation between values calculated for 2026 and 2036
Assessment assumes zero traffic growth beyond 2036
Assessment assumes no change in carbon dioxide emission rates beyond 2036
Highways England speedband emissions factors (v9) based on Defra vehicle emission factor toolkit (EFT v11.0)
Carbon dioxide emissions for 2026 and 2036 calculated within Traffic Model Area

Appendix C. Noise WebTAG Worksheet

Noise WebTAG Worksheet in pdf format provided below. For the full worksheet, please refer to documents reference ([WC M4J17-ATK-ENV-XX-RP-LN-000002](#))

Noise Workbook - Worksheet 1

Proposal Name: M4 J17

Present Value Base Year

Current Year

Proposal Opening year:

Project (Road, Rail or Aviation):

Net present value of change in noise (£):

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

Net present value of impact on sleep disturbance (£):

Net present value of impact on amenity (£):

Net present value of impact on AMI (£):

Net present value of impact on stroke (£):

Net present value of impact on dementia (£):

Quantitative results

Households experiencing increased daytime noise in forecast year:

Households experiencing reduced daytime noise in forecast year:

Households experiencing increased night time noise in forecast year:

Households experiencing reduced night time noise in forecast year:

Qualitative Comments:

Data Sources:

Appendix D. Biodiversity WebTAG Worksheet

Biodiversity WebTAG Worksheet in pdf format provided below. For the full worksheet, please refer to documents reference ([WC_M4J17-ATK-EBD-XX-RP-LE-000003](#))

TAG 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
Bath and Bradford-on-Avon Bats SAC	Greater horseshoe bat and Bechstein's bat are listed as Annex II species that are a primary reason for selection of this site and contains important hibernation sites for these species. Lesser horseshoe bat is listed as an Annex II species present as a qualifying feature, but not a primary reason for site selection. Located approximately 12.5 km from the Site.	International	SACs are considered to be internationally important.	Unknown	Very high	Neutral - no impact on this designated site is anticipated	Neutral
Bats	Habitats within the Site including woodland areas and scattered trees may provide suitable foraging habitats for bats. Hedgerows may also provide suitable foraging and commuting areas for bats. Road bridges may provide bat roosting potential.	International	All UK bats are European Protected Species and protected under Conservation of Habitats and Species Regulations 2017 (as amended) Reg 43 and Wildlife and Countryside Act 1981 (as amended) S.9	Variable depending on species. The latest trends indicate that in most cases, UK bat species are stable or recovering	Very high	Minor negative - the Scheme will require the breaking and resurfacing of the carriageways on the road bridges, causing disturbance to any potential roosts. Daytime inspections of the bridges will determine bat roost potential/presence. As a result of this inspection, further emergence surveys of the bridges may be required in the bat active season (May to September).	Slight Adverse
Reptiles	The field survey identified suitable habitat areas for foraging, resting, sheltering and basking reptiles, particular along the verge of the M4 west bound off slip road where there is a steep grassland bank. Other areas of suitable habitat within the Site include scrub and grassland habitats.	Local	Common UK reptiles (adder, viviparous lizard, grass snake and slow worm) are protected under Wildlife and Countryside Act 1981 (as amended) S.9(1) and S.9(5).	Latest trends suggest all UK species are in decline.	Low	Minor negative - the Scheme will result in a loss of grassland and scrub habitats adjacent to the gyratory and the roundabout approaches which may be utilised by reptiles. Works will be conducted outside of hibernation period (November to February). Materials will be stored away from suitable reptile habitat. Works near to suitable habitat will be conducted under a PMW.	Slight Adverse
Hazel dormouse (<i>Muscardinus avellanarius</i>)	The field survey identified some suitable habitat for hazel dormouse within and surrounding the Site, including woodland, scrub and hedgerows. However, the woodland was considered highly sub-optimal due to the lack of a well-developed understorey and its very limited extent. The hedgerows identified within the Site were species poor and also sub-optimal for hazel dormouse. Scrub areas and woodland along the M4 slip roads may have potential to support foraging and commuting dormouse and have connectivity to other woodlands and hedgerows in the wider area.	International	Species is a European Protected Species and is protected under Conservation of Habitats and Species Regulations 2017 (as amended) Reg 43 and Wildlife and Countryside Act 1981 (as amended) S.9	The latest report on population trends suggests a decline of 51% 2000 to 2019 (an average of 3.8% per year)	Very high	Minor negative - the Scheme will result in a loss of scrub habitat adjacent to the gyratory and the roundabout approaches, potentially suitable for use by dormice. No mature trees will be removed. Vegetation clearance of scrub, woodland or hedgerows will be kept to a minimum where possible and undertaken outside the breeding season (May to August) to avoid harm to dormice and their young. Works near to suitable habitat will be conducted under a PMW.	Slight Adverse
Great Crested Newt (<i>Triturus cristatus</i>)	There is one drainage ditch located approximately 40m south of the Site which may have potential to support great crested newt. Habitats within the Site including grassland, scrub and woodland areas may provide suitable refugia for hibernating, foraging and commuting great crested newt. However, these are not connected to any suitable waterbodies.	International	Great crested newt is a European Protected Species and is protected under Conservation of Habitats and Species Regulations 2017 (as amended) Reg 43 and Wildlife and Countryside Act 1981 (as amended) S.9	Great crested newt numbers are declining over their European natural range.	Very high	Minor negative - the Scheme will result in a loss of grassland and scrub habitats adjacent to the gyratory and the roundabout approaches which may provide refugia. A Habitat Suitability Assessment of the drainage ditch 40m south of the Site will be conducted at the next business case stage, which will inform any necessary mitigation.	Slight Adverse
Nesting birds	The field survey identified areas of suitable habitat for common, widespread species within the Site, including; woodland, scattered trees, scrub and hedgerows.	Local	Species are protected under Wildlife and Countryside Act 1981 (as amended) S.1. Species present within and adjacent to the scheme are likely to comprise of a range of more common notable species.	Dependent on individual species or species communities.	Low	Minor negative - the Scheme will result in a loss of scrub habitat suitable for nesting adjacent to the gyratory and the roundabout approaches. No mature trees will be removed. Mitigation has been suggested to avoid damaging or disturbing any active nests within the scrub. Construction of the scheme is unlikely to have any significant effect on the favourable conservation status of the local populations of common nesting birds.	Slight Adverse

Badger (<i>Meles meles</i>)	Habitats identified within the Site, such as woodland, and scrub may provide suitable foraging habitats for badger as well as opportunities for sett creation. Evidence of badger activity was also found within the Site.	Local	Species is protected under Protection of Badgers Act 1992	Unknown	Low	Minor negative - the Scheme will result in a loss of scrub habitat adjacent to the gyratory and the roundabout approaches, which may be utilised by badger. No mature trees will be removed. A pre-works check for the presence of badger is recommended. Construction of the scheme is unlikely to have any significant effect on the favourable conservation status of the local population of badgers.	Slight Adverse
Swinley Meadow (LWS)	Small, single semi-improved field with patches of richer grassland, located approximately 1.2 km from the Site.	Local	Sites designated at county level for nature conservation.	Unknown	Medium	Neutral - no impact on this designated site is anticipated	Neutral
Stanton Park (LWS)	Semi-natural broadleaved woodland, conifer plantation and mixed woodland on a flat ancient woodland site on clay soil, located approximately 1.7 km from the Site.	Local	Sites designated at county level for nature conservation.	Unknown	Medium	Neutral - no impact on this designated site is anticipated	Neutral
Manor Farm Brook Fields (LWS)	Three small pastures in a shallow valley on oolitic limestone separated by a brook and scrub woodland. Supports areas of unimproved calcareous grassland on steeper slopes. Located approximately 1.8 km from the Site.	Local	Sites designated at county level for nature conservation.	Unknown	Medium	Neutral - no impact on this designated site is anticipated	Neutral
Ell Wood (LWS)	Mostly semi-natural ancient woodland on Kellaways sands and clay, located approximately 2 km from the Site.	Local	Sites designated at county level for nature conservation.	Unknown	Medium	Neutral - no impact on this designated site is anticipated	Neutral
North Draycott Park (LWS)	Old parkland - a high concentration of very old oak trees (many pollards) in semi-improved grassland, located approximately 2 km from the Site.	Local	Sites designated at county level for nature conservation.	Unknown	Medium	Neutral - no impact on this designated site is anticipated	Neutral
Semi-natural broadleaved woodland (BAP Priority Habitat) covering approximately 22% of the Site (4.31 ha)	Found within the roundabout and along the M4 slip roads, A350 and B4122 verges within the Site.	Local	Habitats identified at national level as being most threatened and requiring conservation action under the UK Biodiversity Action Plan.	Wiltshire BAP: positive (action has been taken to improve/ protect / enhance this habitat)	Medium	Neutral - no impact on this habitat is anticipated	Neutral
Species-poor hedgerow with trees (BAP Priority Habitat) covering approximately 1% of the Site (475.6 m)	Found along A429 and B4122 verges within the Site.	Local	Habitats identified at national level as being most threatened and requiring conservation action under the UK Biodiversity Action Plan.	Wiltshire BAP: positive (action has been taken to improve/ protect / enhance this habitat)	Medium	Neutral - no impact on this habitat is anticipated	Neutral
Species-poor hedgerow (BAP Priority Habitat) covering approximately 1% of the Site (342.5 m)	Found along A429 and B4122 verges within the Site.	Local	Habitats identified at national level as being most threatened and requiring conservation action under the UK Biodiversity Action Plan.	Wiltshire BAP: positive (action has been taken to improve/ protect / enhance this habitat)	Medium	Neutral - no impact on this habitat is anticipated	Neutral
Approximately 76% of Site area not covered by BAP Priority Habitat, including existing hardstanding and soft estate (14.78 ha)	Hardstanding, poor semi-improved grassland, dense scrub, scattered scrub and scattered trees cover most of the Site.	Local	These habitats are not considered to be rare or distinctive (in a biodiversity context).	N/A - hardstanding, poor semi-improved grassland, scattered trees and scrub are not monitored habitats	Medium	Minor negative - the Scheme will result in a loss of grassland and scrub habitats adjacent to the gyratory and the roundabout approaches. No mature trees will be removed. Pre-works surveys will identify mitigation appropriate to any protected species on the Site.	Slight Adverse

Reference Sources

Atkins Limited (on behalf of Wiltshire Council) (January 2021) M4J17 Improvements: Preliminary Ecological Appraisal Report
Department for Transport (May 2021) TAG UNIT A3: Environmental Impact Appraisal
Wiltshire Wildlife Trust (2008) Wiltshire Biodiversity Action Plan
Bat Conservation Trust (2016)
The State of the UK's Bats 2017. <https://www.bats.org.uk/our-work/national-bat-monitoring-programme/reports/the-state-of-the-uks-bats>
of Principal Importance and Species of Principal Importance for the Conservation of Biological Diversity in England notified under Section 41 of the NERC Act (2006) and as listed in the England Biodiversity List
Species (November 2019) State of Britain's Dormice 2019
British Trust for Ornithology (February 2011) BTO Research Report 572

Habitats
People's Trust for Endangered

Summary Assessment Score

Overall assessment score of '**Slight adverse**', based on current knowledge of the Scheme.

Qualitative Comments

Overall assessment score is 'Slight adverse' due to the loss of a small area of non-priority habitat which has low biodiversity and earth heritage value, but has potential for protected species. The poor quality of this habitat means that the loss of the habitat would give a 'Neutral' score. However, it is also possible that future surveys may identify populations of protected species (nesting birds, bats, reptiles, hazel dormouse, badger or great crested newt), Which could change the receptor value to 'Medium' or 'High'. As long as appropriate mitigation is provided, this would still result in an overall score of 'Slightly adverse'.

Appendix E. Water Environment WebTAG Worksheet

Water Environment WebTAG Worksheet in pdf format provided below. For the full worksheet, please refer to documents reference ([WC_M4J17-ATK-EWE-XX-RP-LW-000001](#))

TAG Water Environment Impacts Worksheet for M4 Junction 17 Improvements OBC										Without mitigation		Resource assessment score with mitigation	
Description of study area/ summary of potential impacts	Key environmental resource	Features	Indicator of quality	Possible Measures	Assessment data availability	Scale	Rarity	Substitutability	Importance	Magnitude	Significance		
Study area: 1km buffer around the alignment													
Potential Impacts:													
<p>The increase in impermeable road area as a result of road widening could increase the polluted road runoff entering the watercourse (if the road runoff was routed to the watercourse) causing a deterioration in water quality</p> <p>The potential modification of an existing culvert (due to road widening) could disrupt the natural hydraulic and sediment transport processes within the watercourse.</p> <p>These impacts can likely be minimised through mitigation.</p> <p>At waterbody scale these impact would not be significant.</p>	<p>Rodbourne Brook WFD reported reach: Rodbourne Brook - source to conf R Avon (Brist) (GB109053027720)</p>	Water supply	Use of water supply (potable, industrial or agricultural)	Location and number of abstraction points	No abstraction licence information available at the time of reporting. Indicator of quality not used in assessment.							Neutral	
				Volume of water abstracted									
				Use of water (potable most important)									
			Chemical water quality	Existing chemical classification/status and objective under the WFD.	Existing chemical classification: Fail (2019) Chemical objective: Good (2015)	Regional	Commonplace	Replaceable	Medium	Slight adverse	Insignificant		
		Likelihood of a change in classification arising (+ve or -ve)		No information available to indicate direction of change.									
		Transport and dilution of waste products	Presence of surface water discharge points	Location and number of discharge points	No discharge consents information available at the time of reporting Indicator of quality and measures not used in assessment.								
				Volume of effluent discharged									
			Contribution of discharge to total river flow	Proportion of flow made up by effluent at different times of the year									
		Biodiversity	Biological water quality	Existing ecological classification/status and objective under the WFD	Existing classification: Moderate (2019) Objective: Good (2021)	Regional	Commonplace	Replaceable	Medium	Slight adverse	Insignificant		
				Likelihood of a change in classification arising (+ve or -ve)	No information available to indicate direction of change.								
			Fisheries quality	EC Fishery designation (Salmonid, Cyprinid or undesignated)	Not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment.								
				Conservation value of river corridor	Results of River Habitat Survey	River Habitat Surveys have not been undertaken at the time of reporting. Indicator of quality and measure not used in assessment.							
			Presence of designations (e.g. SSSI, NNR, LNR, SINC)	Not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment.									
				Presence of protected species or BAP species	Presence of protected species or BAP species not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment.								
		Aesthetics	Contribution to landscape character and quality	Results of river landscape assessment	Contribution to landscape character and quality not considered in the water environment assessment, refer to landscape assessment. Feature not used in assessment.								
		Cultural heritage	Presence of historic features associated with river	Results of historic environmental assessment	Presence of historic features associated with river not considered in the water environment assessment, refer to Culture Heritage assessment. Feature not used in assessment.								
				Presence of designations (e.g. SAMs, listed buildings)									
		Recreation	Riverside access	Presence of route and importance	Indicator of quality and measure not used in assessment								
			Use of the river for recreation	Presence of facilities and clubs for using the river environment	Indicator of quality and measure not used in assessment								
				Use for angling (number of clubs/membership)	Indicator of quality and measure not used in assessment								
Value to economy	Value of the uses of the river (e.g. commercial fishing, abstractions, discharges, navigation, leisure and riverside development land)	Value to local economy (e.g. employment, relative property prices, cost of alternatives, etc)	Indicator of quality and measure not used in assessment										
Conveyance of flows and material	Presence of watercourses	Number and size of watercourse	Indicator of quality and measure used in floodplain resource so as to not duplicate scoring.										
		Existing flood risk	Indicator of quality and measure used in floodplain resource so as to not duplicate scoring.										
<p>The increase in impermeable road area as a result of road widening could increase the polluted road runoff entering the watercourse (if the road runoff was routed to the watercourse) causing a deterioration in water quality</p> <p>The potential modification of an existing culvert (due to road widening) could disrupt the natural hydraulic and sediment transport processes within the watercourse.</p> <p>These impacts can likely be minimised through mitigation.</p> <p>At waterbody scale these impact would not be significant.</p>	<p>Unnamed watercourse WFD reported reach: No Within the Rodbourne Brook - source to conf R Avon (Brist) (GB109053027720) waterbody</p>	Water supply	Use of water supply (potable, industrial or agricultural)	Location and number of abstraction points	No abstraction licence information available at the time of reporting. Indicator of quality not used in assessment.							Neutral	
				Volume of water abstracted									
				Use of water (potable most important)									
			Chemical water quality	Existing chemical classification/status and objective under the WFD.	Existing chemical classification: Fail (2019) Chemical objective: Good (2015)	Local	Commonplace	Replaceable	Medium	Slight adverse	Insignificant		
		Likelihood of a change in classification arising (+ve or -ve)		No information available to indicate direction of change									
		Transport and dilution of waste products	Presence of surface water discharge points	Location and number of discharge points	No discharge consents information available at the time of reporting Indicator of quality and measures not used in assessment								
				Volume of effluent discharged									
			Contribution of discharge to total river flow	Proportion of flow made up by effluent at different times of the year									
		Biodiversity	Biological water quality	Existing ecological classification/status and objective under the WFD	Existing classification: Good (2019) Objective: Good (2021)	Local	Commonplace	Replaceable	Medium	Slight adverse	Insignificant		
				Likelihood of a change in classification arising (+ve or -ve)	No information available to indicate direction of change								
			Fisheries quality	EC Fishery designation (Salmonid, Cyprinid or undesignated)	Not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment.								
				Conservation value of river corridor	Results of River Habitat Survey	River Habitat Surveys have not been undertaken at the time of reporting. Indicator of quality and measure not used in assessment.							
			Presence of designations (e.g. SSSI, NNR, LNR, SINC)	Not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment.									
				Presence of protected species or BAP species	Presence of protected species or BAP species not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment.								
		Aesthetics	Contribution to landscape character and quality	Results of river landscape assessment	Contribution to landscape character and quality not considered in the water environment assessment, refer to landscape assessment. Feature not used in assessment.								
		Cultural heritage	Presence of historic features associated with river	Results of historic environmental assessment	Presence of historic features associated with river not considered in the water environment assessment, refer to Culture Heritage assessment. Feature not used in assessment.								
				Presence of designations (e.g. SAMs, listed buildings)									
		Recreation	Riverside access	Presence of route and importance	Indicator of quality and measure not used in assessment								
			Use of the river for recreation	Presence of facilities and clubs for using the river environment	Indicator of quality and measure not used in assessment								
				Use for angling (number of clubs/membership)	Indicator of quality and measure not used in assessment								

		Value to economy	Value of the uses of the river (e.g. commercial fishing, abstractions, discharges, navigation, leisure and riverside development land)	Value to local economy (e.g. employment, relative property prices, cost of alternatives, etc)	Indicator of quality and measure not used in assessment										
		Conveyance of flows and material	Presence of watercourses	Number and size of watercourse	Indicator of quality and measure used in floodplain resource so as to not duplicate scoring										
				Existing flood risk	Indicator of quality and measure used in floodplain resource so as to not duplicate scoring										
The increase in impermeable road area as a result of road widening could increase the polluted road runoff entering the watercourse (if the road runoff was routed to the watercourse) causing a deterioration in water quality This impact can likely be minimised through mitigation. At waterbody scale this impact would not be significant.	Unnamed watercourse WFD reported reach: No Within the Sutton Benger Bk - source to conf R Avon (Brist) (GB109053027700) WFD waterbody	Water supply	Use of water supply (potable, industrial or agricultural)	Location and number of abstraction points	No abstraction licence information available at the time of reporting. Indicator of quality not used in assessment.										
				Volume of water abstracted											
				Use of water (potable most important)											
				Chemical water quality		Existing chemical classification/status and objective under the WFD.	Existing chemical classification: Fail (2019) Chemical objective: Good (2015)	Local	Commonplace	Replaceable	Medium	Slight adverse	Insignificant		
						Likelihood of a change in classification arising (+ve or -ve)	No information available to indicate direction of change								
		Transport and dilution of waste products	Presence of surface water discharge points	Location and number of discharge points	No discharge consents information available at the time of reporting Indicator of quality and measures not used in assessment										
				Volume of effluent discharged											
				Contribution of discharge to total river flow		Proportion of flow made up by effluent at different times of the year									
		Biodiversity	Biological water quality	Existing ecological classification/status and objective under the WFD	Existing classification: Good (2019) Objective: Good (2021)	Local	Commonplace	Replaceable	Medium	Slight adverse	Insignificant				
				Likelihood of a change in classification arising (+ve or -ve)	No information available to indicate direction of change										
			Fisheries quality	EC Fishery designation (Salmonid, Cyprinid or undesignated)	Not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment										
			Conservation value of river corridor	Results of River Habitat Survey	River Habitat Surveys have not been undertaken at the time of reporting. Indicator of quality and measure not used in assessment										
		Presence of designations (e.g. SSSI, NNR, LNR, SINCS)		Not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment											
		Presence of protected species or BAP species		Presence of protected species or BAP species not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment											
		Aesthetics	Contribution to landscape character and quality	Results of river landscape assessment	Contribution to landscape character and quality not considered in the water environment assessment, refer to landscape assessment. Feature not used in assessment.										
		Cultural heritage	Presence of historic features associated with river	Results of historic environmental assessment	Presence of historic features associated with river not considered in the water environment assessment, refer to Culture Heritage assessment. Feature not used in assessment.										
				Presence of designations (e.g. SAMs, listed buildings)											
		Recreation	Riverside access	Presence of route and importance	Indicator of quality and measure not used in assessment										
			Use of the river for recreation	Presence of facilities and clubs for using the river environment	Indicator of quality and measure not used in assessment										
				Use for angling (number of clubs/membership)	Indicator of quality and measure not used in assessment										
Value to economy	Value of the uses of the river (e.g. commercial fishing, abstractions, discharges, navigation, leisure and riverside development land)	Value to local economy (e.g. employment, relative property prices, cost of alternatives, etc)	Indicator of quality and measure not used in assessment												
Conveyance of flows and material	Presence of watercourses	Number and size of watercourse	Indicator of quality and measure used in floodplain resource so as to not duplicate scoring												
		Existing flood risk	Indicator of quality and measure used in floodplain resource so as to not duplicate scoring												
The increase in impermeable road area as a result of road widening could increase the polluted road runoff entering the watercourse (if the road runoff was routed to the watercourse) causing a deterioration in water quality This impact can likely be minimised through mitigation. At waterbody scale this impact would not be significant.	Sutton Benger Brook WFD reported reach: Sutton Benger Bk - source to conf R Avon (Brist) (GB109053027700) WFD waterbody	Water supply	Use of water supply (potable, industrial or agricultural)	Location and number of abstraction points	No abstraction licence information available at the time of reporting. Indicator of quality not used in assessment.										
				Volume of water abstracted											
				Use of water (potable most important)											
				Chemical water quality		Existing chemical classification/status and objective under the WFD.	Existing chemical classification: Fail (2019) Chemical objective: Good (2015)	Regional	Commonplace	Replaceable	Medium	Slight adverse	Insignificant		
						Likelihood of a change in classification arising (+ve or -ve)	No information available to indicate direction of change								
		Transport and dilution of waste products	Presence of surface water discharge points	Location and number of discharge points	No discharge consents information available at the time of reporting Indicator of quality and measures not used in assessment										
				Volume of effluent discharged											
				Contribution of discharge to total river flow		Proportion of flow made up by effluent at different times of the year									
		Biodiversity	Biological water quality	Existing ecological classification/status and objective under the WFD	Existing classification: Good (2019) Objective: Good (2021)	Regional	Commonplace	Replaceable	Medium	Slight adverse	Insignificant				
				Likelihood of a change in classification arising (+ve or -ve)	No information available to indicate direction of change										
			Fisheries quality	EC Fishery designation (Salmonid, Cyprinid or undesignated)	Not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment										
			Conservation value of river corridor	Results of River Habitat Survey	River Habitat Surveys have not been undertaken at the time of reporting. Indicator of quality and measure not used in assessment										
		Presence of designations (e.g. SSSI, NNR, LNR, SINCS)		Not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment											
		Presence of protected species or BAP species		Presence of protected species or BAP species not considered in the water environment assessment, refer to Biodiversity assessment. Indicator of quality and measure not used in assessment											
		Aesthetics	Contribution to landscape character and quality	Results of river landscape assessment	Contribution to landscape character and quality not considered in the water environment assessment, refer to landscape assessment. Feature not used in assessment.										
		Cultural heritage	Presence of historic features associated with river	Results of historic environmental assessment	Presence of historic features associated with river not considered in the water environment assessment, refer to Culture Heritage assessment. Feature not used in assessment.										
				Presence of designations (e.g. SAMs, listed buildings)											
		Recreation	Riverside access	Presence of route and importance	Indicator of quality and measure not used in assessment										
			Use of the river for recreation	Presence of facilities and clubs for using the river environment	Indicator of quality and measure not used in assessment										
				Use for angling (number of clubs/membership)	Indicator of quality and measure not used in assessment										

		Value to economy	Value of the uses of the river (e.g. commercial fishing, abstractions, discharges, navigation, leisure and riverside development land)	Value to local economy (e.g. employment, relative property prices, cost of alternatives, etc)	Indicator of quality and measure not used in assessment									
		Conveyance of flows and material	Presence of watercourses	Number and size of watercourse	Indicator of quality and measure used in floodplain resource so as to not duplicate scoring									
				Existing flood risk	Indicator of quality and measure used in floodplain resource so as to not duplicate scoring									
<p>There is a potential increases in flood risk as a result of: The road widening potentially encroaching into Flood Zones 2 and 3.</p> <p>The potential increase in surface water runoff as a result of an increase in impermeable road area (caused by road widening).</p> <p>The potential modification to an existing culvert could result in flow constrictions and cause water to back during times of flooding and raise peak water levels.</p> <p>These impacts can likely be minimised through mitigation.</p>	Rodbourne Brook floodplain	Conveyance of flood flows	Presence of flood zones	Existing flood risk/flood return period	Flood Zones 2 and 3 are associated with the watercourse.	Local	Rare	Limited no substitution	High	Large adverse	Highly significant	Neutral		
			Flood flow routes	Location / importance of flood flow routes	Unknown at the time of reporting. Indicator of quality not used in assessment.									
			Surface water flooding	Location of surface water flooding	Unknown at the time of reporting. Indicator of quality not used in assessment.									
		Biodiversity	Conservation value of river corridor	Results of River Habitat Survey		River Habitat Surveys have not been undertaken at the time of reporting.								
				Presence of designations (e.g. SSSI, NNR, LNR, SINC)s		Presence of designations is not considered under the floodplain resource. Feature not used in assessment.								
				Presence of protected species or BAP species		Presence of protected species or BAP species not considered in the water environment assessment, refer to Biodiversity assessment. Feature not used in assessment.								
		Aesthetics	Contribution to landscape character and quality	Results of river landscape assessment		Contribution to landscape character and quality not considered in the water environment assessment, refer to landscape assessment. Feature not used in assessment.								
<p>The increase in impermeable road area as a result of road widening could increase the polluted road runoff entering the aquifer (if the road runoff was routed to ground) causing a deterioration in water quality</p> <p>This impact can likely be minimised through mitigation.</p> <p>At waterbody scale this impact would not be significant.</p>	Secondary A Bedrock Aquifer Located in the Malmesbury groundwater body (GB40402G990300)	Water supply	Use for water supply (potable, industrial or agricultural)	Location and number of abstraction points	No abstraction licence information available at the time of reporting. Indicator of quality not used in assessment.							Neutral		
			Volume of water abstracted											
			Use of water (potable most important)											
			Groundwater vulnerability	Location and grade of source protection zone		No Source Protection Zones. Measure not used in assessment.								
			Classification of aquifer vulnerability	Groundwater vulnerability classification: Minor Aquifer		Local	Rare	Limited no substitution	Medium	Slight adverse	Insignificant			
			Classification/status and objective under WFD	Existing classification (overall water body): Good (2019) Objective (overall water body): Good (2015)		Regional	Rare	Limited no substitution	Medium	Slight adverse	Insignificant			
		Transport and dilution of waste products	Presence of discharge points	Location and number of discharge points		No discharge consents information available at the time of reporting. Feature not used in assessment.								
				Location and number of discharge points										
		Value to the economy	Value of the uses of the groundwater (e.g. abstractions and discharges)	Value to local economy (e.g. employment, cost of alternatives, etc.)		No abstraction licence or discharge consent information available at the time of reporting. Feature not used in assessment.								
		Biodiversity	Conservation value of areas fed by groundwater	Results of River Habitat Survey		River Habitat Surveys have not been undertaken at the time of reporting. Feature not used in assessment.								
Presence of designations (e.g. SSSI, NNR, LNR, SINC)s				Feature not used in assessment.										
Presence of protected species or BAP species				Presence of protected species or BAP species not considered in the water environment assessment, refer to Biodiversity assessment. Feature not used in assessment.										
Conveyance of flood flows	Flow routes	Location and importance of flow routes		Unknown at the time of reporting. Feature not used in assessment.										
		Groundwater levels	Charges in levels and recharge											

Reference Sources

Design drawing - M4 Junction 17
 Environmental datasets held on Defra's MAGIC website <https://magic.defra.gov.uk/home.htm>
 Environment Agency - Catchment Data Explorer <http://environment.data.gov.uk/catchment-planning/>
 British Geological Survey's Geology of Britain Viewer <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Summary Assessment Score (with mitigation)

Neutral

Qualitative Comments

The M4 Junction 17 Improvements Scheme will result in an increase in impermeable road area. This could potentially impact the water quality of Rodbourne Brook, Sutton Bengier Brook and two unnamed watercourses and/or the underlying aquifer's water quality (depending on where road drainage is discharged to). There is also potential for the increase in impermeable road area to cause an increase in flood risk as a result of an increase in surface water runoff. Sustainable drainage measures that attenuate runoff volumes could be implemented to mitigate an increase in surface water flood risk or fluvial flood risk associated with more water entering a watercourse. These measures can also be designed to remove suspended solids, dissolved copper and dissolved zinc and they are also effective for spillage control. The exact choice of system is dependent on the physical environment of the Scheme and needs to consider the availability of land, climate and rainfall characteristics, soil permeability and topography.

There is the possibility that the road widening could encroach into Flood Zones 2 and 3. If this were the case then floodplain storage compensation would be required.

Also potential modifications to an existing culvert could potentially impact the hydromorphology of Rodbourne Brook and increase flood risk by causing flow constrictions at times of flooding. Potential impacts on hydromorphology could be mitigated by following environmentally sensitive culvert design standards, including the potential for enhancements up and downstream where practical. Potential impacts on flood risk would need to be further assessed through a Flood Risk Assessment (FRA) and the culvert sized appropriately to ensure there is no increase in flood risk.

As there is a potential impact which is highly significant the overall assessment score for the operation of the M4 Junction 17 Improvements Scheme is large adverse. This has been determined with reference to sections 5.3.15 – 5.3.20 and 10.2 of TAG UNIT A3 - Environmental Impact Appraisal, May 2019, Department for Transport, Transport Analysis Guidance, as summarised below:

- Most adverse category. The scheme as a whole is assessed according to the most adverse assessment of the features affected i.e. if a single feature scores 'large adverse' and this is the highest individual assessment score for all features then the overall assessment score should be 'large adverse'.

However, applying water quality and flood risk mitigation will reduce the significance of effect to neutral.

Appendix F. Landscape WebTAG Worksheet

Landscape WebTAG Worksheet in pdf format provided below. For the full worksheet, please refer to documents reference ([WC M4J17-ATK-ELS-XX-RP-LL-000001](#))

TAG Landscape Impacts Worksheet

Features	Step 2	Step 3				Step 4	Opportunities for Mitigation
	Description	Scale it matters	Rarity	Importance	Substitutability	Impact	
Pattern	<p>The study area pattern is an undulating, clay-dominated, low-lying rural landscape that is centred on the Cotswold Escarpment with relatively little woodland cover. The area has a regular pattern of medium to large sized fields with field boundary hedgerows, hedgerow and individual trees and linear belts of shrubs and trees of a predominantly deciduous nature. There are some gaps in the vegetation which provide open, long-range views over the rural landscape.</p> <p>The landscape adjacent to the M4 is predominantly vegetated by linear belts of shrubs and trees to the north and south of the carriageway. As the M4 continues under the Stanton St. Quintin roundabout it traverses the landscape through a cutting with small to medium sized deciduous copse north and south of the carriageway.</p> <p>The River Avon flows through the landscape approximately 3.5km to the east of the study area and runs north/south. The river Avon is lined either side with scattered trees of a riparian and deciduous nature.</p> <p>A coherent pattern of landscape elements with some detracting features including power lines, farm and commercial buildings, roads and road junctions.</p>	Regional and local	Regionally and locally common	Medium regional and local importance	Highway's planting is substitutable in the medium term. (15 years for replacement planting to provide current cover)	<p>The widening of the road alignment coupled with any required de-vegetation and the elevated nature of the existing road corridor will allow the M4 J17 to become more apparent and open up the pattern of the landscape. However, over time the pattern will be restored through mitigation and enhancement measures. This will aid to minimise long-term impact on the landscape pattern.</p> <p>Based on the anticipated amount, location, quality and substitutability of the vegetation lost, this would result in a Moderate Adverse impact initially and reducing over time to a Slight Adverse impact post year 15 with the mitigation and enhancement measures in place.</p>	There would be benefits in strengthening the screening of the highway planting, by carrying out some off site planting, particularly if planting with a higher ratio of evergreen species. These would act as additional sound buffer and visual screen in the landscape framework.
Tranquillity	<p>In general the tranquillity directly adjacent to the M4 J17 is low as it is affected and disturbed by the M4. The surrounding landscape and nearby communities are afforded protection by established, mature vegetation including hedgerows with trees, small woodlands, and linear belts of shrubs and trees. The vegetation, albeit deciduous, helps to integrate the M4 J17 into the surrounding landscape and provides screening.</p> <p>Within the rural landscape, approximately 3.5km east of M4 J17, a river corridor possess a peaceful, undisturbed pastoral character.</p> <p>Approximately 1km North and 930m north-west of M4 J17, Lower Stanton St. Quintin and Stanton St. Quintin reside respectively. Residential properties, road networks and the MOD Hillington Barracks, approximately 1.3km north of M4 J17, are dominant features of the urban character reducing the level of tranquillity in these areas.</p> <p>Approximately 250m north-east of M4 J17 is predominantly agricultural with farm buildings and fields. South-east is predominantly agricultural with some commercial buildings along B4122 including Quintin Recycling Centre (Approx. 740m) and Wessex Auction Rooms (Approx. 1km), these reduce the level of tranquillity slightly.</p> <p>South-west of M4 J17 is predominately agricultural with some commercial buildings including Chippenham Pallet Company Ltd along the A350 (Approx. 630m) and C D Fencing along Stanton Lane (Approx. 950m). The effect on tranquillity is low due to the location of these commercial properties.</p>	Local	Typical for the area	High local importance	Not substitutable	<p>During the construction stage, the elevated sections of road as well as new sections of road corridor associated with the planned widening, would be visible within the landscape. This would result in a reduction in tranquillity in the areas directly adjacent. The tranquillity of these areas will be temporarily altered by the works and early operation of the improved junction. This would be considered in context with the various existing transport routes traversing across the landscape and the potential for minimising the adverse effects through adequate mitigation and enhancement measures.</p> <p>This proposal would directly affect the route corridor and land within it and would lead to a change in the tranquillity to the adjacent areas. Vegetation will be required to be removed to allow for the works thereby reducing the potential for tranquillity during construction and early operational phases. This would result in a Slight Adverse impact initially and reducing over time to a Neutral impact post year 15 with the mitigation and enhancement measures in place.</p>	During the construction phase also take into consideration, noise and movement of vehicles in so far as it may affect the perception of tranquillity in the landscape, access arrangements and traffic movements and looking at methods of potentially phasing the development over the operational stage.

Cultural	<p>There are a number of historical features such as Listed Buildings (9 approx. 1km north-east, 23 approx. 1.3km north, 2 approx. 1.3km north-east, 2 approx. 1km south-east and 2 approx. 1km south-west) and a few Scheduled Monuments within the wider landscape (1 approx. 1.6km north-east, 1 approx. 1.8km south-east and 1 approx. 1.2km north-west) as well as Stanton St. Quintin Conservation Area, directly adjacent to M4 J17 northern side, which contribute to the landscape character.</p> <p>Nucleated villages with many retaining their traditional character. There is modern suburban housing within the larger villages, approximately 1km north and north-west.</p> <p>Stanton St. Quintin Site of Special Scientific Interest (SSSI) is in two parts across the study area with the larger half being located directly within M4 J17 and the smaller half being approx. 970m north-east.</p> <p>The surrounding countryside has several Public Rights of Way (PRoW) crossing agricultural land and alongside the local river network. The PRoW in close proximity to M4 J17 are: North-west - SSTQ2 and SSTQ3 (Approx. 1km and 550m respectively). North-east - SSTQ4 (Approx. 400m) South-east - KLAN26, KLAN29, KLAN30 and SBEN14 (Approx. 640m, 605m, 680m and 790m respectively) South-west - KSTM5 and KSTM7 (Approx. 1km and 700m respectively). National Cycle Route 403 passes through Chippenham south of M4 J17.</p>	Heritage features matter at a regional and national scale	Regionally common	Regionally and locally common	Not substitutable	<p>Historical features that contribute to the landscape character and visual amenity including Listed Buildings, Scheduled Monuments, and Stanton St. Quintin Conservation Area would potentially be affected.</p> <p>The works will potentially result in an adverse effect on the visual amenity, upon several receptors including properties of Stanton St. Quintin to the north-west and Lower Stanton St. Quintin to the north of the works. Also, isolated farms and properties north-east, south-east and south-west of M4 J17 as well as users of the PRoWs adjacent would experience an adverse effect on visual amenity.</p> <p>However, through considered design and landscaping along the M4 J17, the road corridor could be increasingly contained, minimising impact on the surrounding cultural features and visual amenity. This would result in a Moderate Adverse impact initially and reducing over time to a Minor Adverse impact post year 15 with the mitigation and enhancement measures in place.</p>	PRoW - Ensure advanced notification of construction work for PRoW users. It is also recommended that reinstatement of the original route is undertaken.
Landcover	<p>The landcover adjacent to the M4 is predominantly vegetated by linear belts of deciduous shrubs and trees to the north and south of the carriageway. As the M4 continues under the Stanton St. Quintin roundabout the land goes into cutting where a small to medium sized deciduous copse lying north and south of the carriageway.</p> <p>The landcover just beyond the M4 J17 is characterised by agricultural fields with field boundary hedgerows. The trees are deciduous with some small-scale broad-leaved woodlands scattered throughout the landscape.</p> <p>The landscape is intensely farmed with a higher percentage of pasture to arable. The area's generally fertile soils and good quality agricultural land have supported a diversity of farming over a long period but, because of this, little semi-natural habitat remains. The River Avon and its flood plain is a distinctive feature running through the landscape. This is a major corridor for wildlife moving through the area and for supporting a variety of wetland habitats.</p> <p>There are a number of veteran trees approximately 1.5km east of the study area, both north and south of the M4.</p>	Regional and Local	Regionally and locally common	Medium regional and local importance	Arable land cover is substitutable in the short to medium term.	<p>Due to the widening and construction of new highway linear belts of deciduous shrubs and trees adjacent to the M4 will be lost.</p> <p>However, through mitigation and enhancement measures the adverse effects would potentially be minimised reducing the overall impact on the surrounding landcover.</p> <p>Based on the assumption that a certain amount of vegetation shall be lost and considering the location, quality, and substitutability of said vegetation it is reasoned that this will potentially result in a Moderate Adverse impact.</p> <p>The potential significance of effect is therefore deemed to be Moderate Adverse impact initially and reducing over time to a Minor Adverse impact post year 15 with the mitigation and enhancement measures in place.</p>	<p>Any adverse effects can potentially be mitigated through such measures as:</p> <ul style="list-style-type: none"> - Vegetation removal should be kept to that necessary for the works and, where possible, avoid mature species; - Vegetation removed should be replaced on a like for like basis where possible, suitable alternatives should be proposed in the case that the species cannot be matched; - Where possible bunding with vegetative screening including evergreen species that fit with the local vernacular to aid screening to be established; - Enhancement of the environment along the Scheme to improve the experience for residents, pedestrians, cyclists, and vehicle users; - Retain and make best use of existing vegetation; - Prioritise the early re-establishment of vegetation within the highway boundary; - Use native species of local provenance wherever possible; - Plant species to benefit local conservation works; - Off-site planting to aid screening where possible, including woodland planting if possible. Evergreen species to be included that fit with the local vernacular; - Planting to comply with and support landscape management strategies set by local authorities for the landscape character area; and - Proposed Planting should provide visual interest and diversity including suitable evergreen species.

Summary of character	<p>The area is low lying with an undulating topography having a regular pattern, allowing open long-range views in many areas.</p> <p>Within the study area there is a noticeable retention of tranquillity around the study area with the M4 J17 being less tranquil due to it being a major road corridor and Stanton St. Quintin Lower Stanton St. Quintin having a lower level of tranquillity due to its residential nature. The River Avon and wider countryside allows for a more tranquil setting.</p> <p>There are several listed buildings and a few Scheduled Monuments within the wider landscape and including Stanton St. Quintin Conservation Area. Stanton St. Quintin Quarry and Motorway Cutting SSSI resides within Stanton St. Quintin Roundabout.</p> <p>The surrounding countryside has several Public Rights of Way including National Cycle Route 403 running south of the study area through Chippenham, and alongside the local river network. There are several veteran trees to the east of the study area.</p> <p>The landscape is heavily farmed with the landcover being predominantly pasture. The River Avon and its flood plain is a distinctive feature running through the landscape.</p>	Regional and local	Regionally and locally common	Medium	Some opportunity for substitution	<p>The proposed widening of the M4 J17 has the potential to result in direct effects however, there are opportunities to mitigate and enhance the scheme design to avoid, minimise and offset these effects.</p> <p>There is some uncertainty given that the environmental design and mitigation strategy is still to be developed however, due to the existing nature of the scheme being a major motorway any additional works will have a Minor Adverse effect and reducing to Neutral post year 15 as long as mitigation and enhancement measures have been established.</p>
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Reference Sources

DfT TAG Unit A3, May 2019 (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/825064/tag-unit-a3-environmental-impact-appraisal.pdf)
National Character Area 117: Avon Vales, (Natural England, January 2014)
Wiltshire GIS data (<https://wiltscouncil.maps.arcgis.com/apps/webappviewer/index.html?id=43d5a86a545046b2b59fd7dd49d89d22>)
Woodland Trust – Ancient Tree Inventory
Natural England GIS Data
English Heritage GIS Data
Sustrans GIS Data
OS Open Data
Google Earth
Google Streetview

Step 5 - Summary Assessment Score

Slight Adverse

Qualitative Comments

A 2km offset from the centre line of the road has been used for the study area within this local character area. It is considered that adverse effects are unlikely beyond this.

The overall assessment score for the Scheme has been determined with reference to sections 5.3.15 – 5.3.20 and 6.2 of TAG UNIT A3, Environmental Impact Appraisal, May 2019, Department for Transport, Transport Analysis Guidance as summarised below:

- Cumulative adverse effects. Where it is clear that there is a cumulative effect across a range of key environmental resources, then the scheme as a whole should be scored in a higher category than the key environmental resources in isolation. For example, a scheme may affect a number of key environmental resources, each of which is assessed 'slight adverse'. Where it is clear that there is a cumulative effect across the key environmental resources, the scheme as a whole would be assessed as 'moderate adverse'.

All measurements are approximate and have been taken from the centre of the study area.

It is noted that a precautionary principle has also been applied due to uncertainty with regards the environmental design and mitigation strategy.

Appendix G. Historic Environment WebTAG Worksheet

Historic Environment WebTAG Worksheet in pdf format provided below. For the full worksheet, please refer to documents reference ([WC_M4J17-ATK-EHR-XX-RP-LH-000001](#))

TAG Historic Environment Impacts Worksheet

Step 2		Step 3			Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	The Junction Improvement Scheme is centred on the area of the M4 Junction 17. The area surrounding the scheme is made up of agricultural land with the M4 running east to west and the A429 and A350 running north to south. The historic environment surrounding M4 Junction 17 is comprised of archaeological and built heritage that shows evidence of human activity from the Neolithic Period until the Modern Era. In the immediate vicinity (within 1 km) of the M4 Junction 17 there is evidence of Medieval and 17th century occupation of the area such as farmsteads. There are no World Heritage Sites (WHS) or Scheduled Monuments (SM) within 1km of the scheme. The Stanton St Quintin Conservation Area is located within 1km of the scheme. Additionally, no listed buildings of any grade (I, II, or II*) are located within 1km of the M4 Junction 17.	The non-designated historic monuments, seven 19th century farmsteads, are the only heritage assets within the study area. These matter at a local level under the NPPF and DMRB methodologies.	In accordance with the methodology set out in the Design Manual for Roads and Bridges (DMRB) the assets within the study area of low significance, based on current understanding. The non- scheduled monuments within the study area which consist of 19 th century farmsteads ranging from robust survival to almost no original structure left, have low significance.	The form of the historic environment within the study area is not rare. 19th century farmsteads are common across the region.	The construction of the scheme will result in no temporary or permanent physical impacts to any heritage assets (designated or non-designated). The operation of the scheme would result in no temporary or permanent adverse impacts on the settings of designated assets (outside of the study area) due to the improvements of the M4 Junction 17.
Survival	Good to poor. While the individual assets may be well preserved, the overall historic environment has been degraded somewhat by the development of the M4 Junction 17. Within the scheme there are undisturbed areas as well as areas that have been previously investigated for development of the M4 and disturbed from associated works.	The survival of an asset may have an impact on its designation, however it is its designation which defines how much it matters under legislation, policy, and guidance	The survival of an asset may have an impact on its designation, however it is its designation which defines its significance under the methodology of DMRB.	The level of survival within the study area is not rare. 19th century farmsteads are common across the region.	
Condition	It is beyond the remit of this exercise to evaluate the condition of individual heritage assets. However, the condition of the known heritage assets within the study area is typical for the context	The condition of the historic environment within the study area matters at a local scale, as none of the assets are protected at a larger scale.	The condition of the historic environment within the study area is significant at a local level, contributing to local character and able to contribute to local research objectives	The condition of the historic environment within the study area is not rare.	

Complexity	The historic environment of the study area is not complex. There are no designated heritage assets with the study area. The non-designated assets within the study area, all are representative of 19 th century farmsteads. This is consistent with how the landscape is being used contemporarily. This is an area of agricultural land use that is bisected by existing sections of motorway. There is little archaeological presence within this area.	The survival of the historic environment of this level of complexity matters at a local scale	The level of complexity of the historic environment in the study area is significant at a local level	The complexity of the historic environment within the study area is not rare.
Context	The presence of farmsteads within the study area, and the contemporary agricultural land use demonstrates the role of this area as farmland for an established period of time.	The context of the historic environment within the study area matters at a local scale, demonstrating local character and land-use and subject to local policies and guidance	The context of the historic environment is significant at a local level, able to contribute to local research objectives and providing local character.	The context of the historic environment within the study area, with 19th century farmsteads dispersed within modern settlement and infrastructure, is common.
Period	There are non-scheduled monuments within the study area that are all 19 th century farmsteads. Within close proximity to the study area there are more archaeological remains evident from the scheduled monuments ranging from the Medieval period to the 18 th century, and a non-scheduled monument representing a Romano-British burial dated to 43 AD - 409 AD.	As above, the period of an asset may have an impact on its designation, however it is its designation which defines how much it matters in legislation, policy, and guidance.	As above, the period of an asset or assets may have an impact on its designation, however it is its designation which defines its significance under the methodology of DMRB. The period of the non-designated assets as understood is taken into account for defining their significance. Additional investigation would be required to determine the significance of buried archaeological remains. Current baseline evidence suggests they would be of local significance	The periods represented in the study area are not rare. 19th century farmsteads are common across the region.

Reference Sources

The National Heritage List for England. Local authority information relating to conservation areas and non-designated heritage assets. Edwards, B. (2014) Wiltshire Farmsteads Mapping Project Data. Forum Heritage Services. PRN601730. Edwards, B. Lake, J. (2014) Wiltshire & Swindon Farmsteads & Landscape Project. Forum Heritage Services. Lake, J. Edwards, B. (2014) Wiltshire and Swindon Farmsteads Guidance. Farmsteads. Assessment Framework. English Heritage and Wiltshire Council. Lake, J. Edwards, B. (2014) Wiltshire and Swindon Farmsteads Guidance. Wiltshire and Swindon Farmsteads Character Statement. English Heritage, Wiltshire Buildings Record, Wiltshire Council and Swindon Borough Council.

Step 5 - Summary Assessment Score

Neutral Effect

Qualitative Comments

The construction of the scheme results in no permanent moderate adverse impacts on heritage assets in the vicinity of the M4 Junction 17. The Improvements to the junction will result in no adverse impacts due to these works being carried out on existing junction and roads where any archaeological remains have already been identified by survey works or truncated/disturbed by previous construction activity. The operation of the scheme results in no adverse impacts on the settings of designated heritage assets.