

Smart Motorways Programme

M4 Junctions 3 to 12 Smart Motorway

Non-Material Change

Sipson Road Subway

Technical Note

Document Number: HA514451-CHHJ-GEN-SZ_ZZZZZZZZ_Z-TN-KK-0060

April 2022

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1 Introduction

The Development Consent Order (DCO) was granted for the M4 Junctions 3 to 12 Smart Motorway scheme (the scheme) in September 2016.

Due to the proposed realignment and widening of the junction 4 slip roads, structural works to widen the subway are required. The design of the widening at Sipson Road Subway has changed since the DCO was granted to take place on the north side of the M4, rather than the south side of the M4. This change requires a Non-Material Change (NMC) Application as it does not accord with the principles of the Engineering Design Report as submitted with the DCO application and thus, pursuant to Requirement 6 of the DCO, could not, absent a NMC, be brought forward.

This technical note provides a summary of the changes made to the design of Sipson Road Subway, why these changes have been made and an appraisal of the impacts compared to those assessed for the DCO design.

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2 Background

The M4 is a strategic part of both the English and Welsh road network, connecting London to South Wales. The scheme is located on 32 miles of the M4, between junction 3 and junction 12. It comprises of 28 miles of three-lane motorway and four miles of four-lane motorway between junction 4 and 4b. The scheme includes the M4 to M25 interchange; the junction for Heathrow Airport and; passes by several key regional centres including Slough, Windsor, Maidenhead, Wokingham and Reading.

The existing Sipson Road Subway structure carries the M4 over Sipson Road footpath/cycleway (**Error! Reference source not found.**Figure 1). The subway is located west of junction 4 and was constructed in 1965. The structure comprises of a single span in-situ reinforced concrete box structure with a clear span of 2.5m and length of 55.1m.

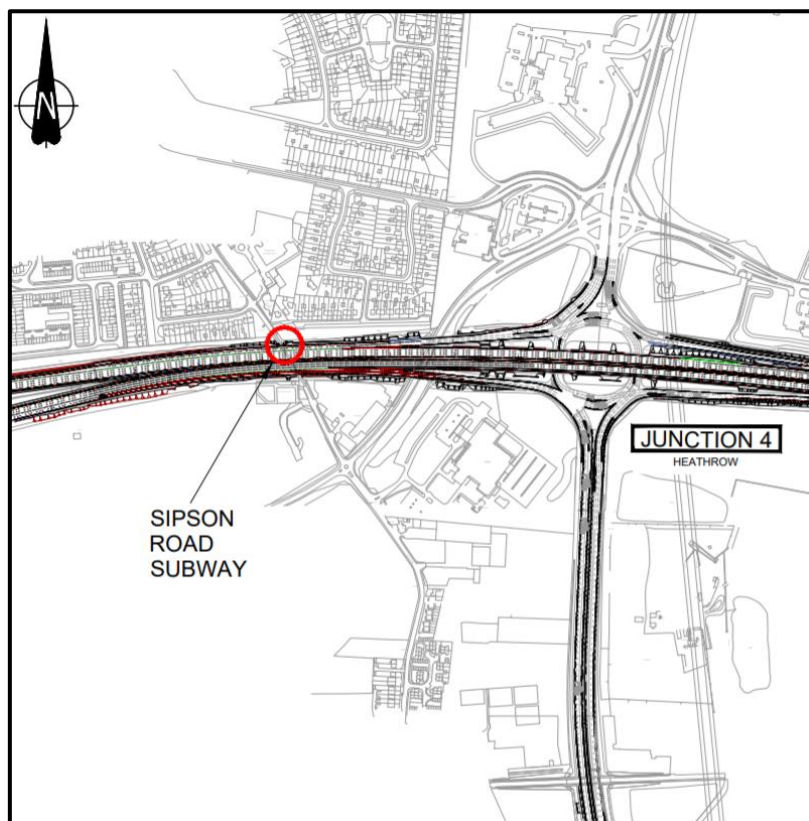


Figure 1 Location of Sipson Road Subway

3 2015 DCO Design

The following approach was the previously proposed solution for Sipson Road Subway as detailed within the DCO.

The existing deck would have been asymmetrically widened to the south side by approximately 5m to accommodate the four lane SMP and junction 4 merge slip road. The widening would have comprised of a reinforced concrete bridging slab with the bank seats at each end, and a rigid stitch connection to the existing reinforced concrete subway box.

An assessment carried out in November 2017 found that the rigid stitch would overstress the existing box structure of the subway. As a result, a longitudinal joint was proposed and the bridging slab stiffened; however, there remained a differential settlement between the new and existing structures (5mm in normal loading and up to 30mm in abnormal loading).

The joint between the structures would have run longitudinally along the carriageway. This would have resulted in a Departure from Standard to the Highway Pavement Design. A Departure from Standard is applied for when a designer wishes to deviate from the formally published design standards. Due to the time taken to carry out rigorous assessments (and uncertainty of their outcome) on the requested departure, an alternative design solution was required.

Alternative options on the south side were limited due to the existing condition of the structure and the extensive gas, water, electricity and telecommunications utilities found in the vicinity. To prevent the differential settlement, strengthening to the underpass wall, top and bottom slab would have been required. Space constraints due to the presence of utilities prevent strengthening from being applied to the outside of the structure, and internally there is insufficient headroom and width to strengthen without impacting upon pedestrians and cyclists. Therefore, an alternative solution was required that would allow realignment of the mainline, but not reduce headroom, nor require closure of the subway for the duration of the works.

4 2021 NMC Design

4.1 Structural Change

An alternative solution has been developed which changes the requirement to extend the subway on the southern side.

The change from the 2015 DCO Design includes the relocation of a running lane on the M4 at Sipson Road Subway of approximate 3m on the westbound side and 0.2m on the eastbound side.

This solution requires the construction of a 1.2m wide retaining beam (supported on pile caps and piles) to the northern side (eastbound) of the M4. The beam will retain the fill above the subway and provide support to the proposed parapet and environmental barrier to be located above it. It will also allow for the kerb line on the eastbound carriageway to move northwards, allowing the All Lane Running (ALR) M4 to fit within the existing Sipson Road Subway footprint and removing the requirement for widening the structure on the south side.

The beam will have a length of 16.7m and be spanning over the existing subway and the buried utilities found either side of it. Extending the beam over the services will minimise any impact on them due to the scheme; negating the need for any diversion works.

In order to minimise noise disruption to the residents and the school on the north side, a precast solution has been chosen. Due to restricted headroom above the subway, formwork for an in situ construction will not allow for the minimum required headroom to be maintained during the temporary works and therefore the proposed precast section of beam spanning over it is optimal. This will result in a shorter programme than for an in situ cast beam, and, therefore, less noise and disturbance as it will be built off site. It is expected that the construction works on site will be shortened by up to 3 months, not including the time saved by not carrying out the complex utility diversions that would have been required by widening the subway on the south side. To minimise the weight and number of lifts, the remaining two sections that are spanning over the services will be constructed in situ and be mechanically stitched into the central precast section.



Figure 2 Sipson Road Subway – North Elevation – Existing



Figure 3 Sipson Road Subway – North Elevation – Proposed

4.2 Drainage changes

As the changes at Sipson Road subway are related to a structure that has been widened over the M4, there has been no significant impact of these changes to the drainage proposals.

4.3 Earthworks changes

As detailed above, the 2015 DCO Design called for primarily structural widening of the subway at the southern end, with minor regrading of the existing earthworks being required.

The 2021 NMC Design reflects the realignment of the scheme northward and the removal of the requirement for widening out over the southern portal of the existing subway. Instead, widening is required at the north subway portal, but this is of a reduced amount as a result of the incorporation of both the environmental barrier and the vehicle parapet onto a piled edge beam.

The earthworks changes required at the north portal of Sipson Road Subway are relatively minor, with changes in the local form of the existing embankment slopes required to bury the new pile caps and thus blend the structure in with the existing topography. The new embankments will have 1:2 vertical:horizontal side slope gradients and thus be amenable to planting. This will aid in the partial screening of the piled beam in the long-term.

5 Safety

5.1 Driver safety

There are no impacts on safety of drivers passing over Sipson Road Subway on the M4 as a result of the design change.

5.2 Workforce safety

The proposed works are now restricted to the northern side of Sipson Road Subway. The structural works can be carried out away from the road, the workforce will work within the M4 boundary but away from the road and separated by the existing fencing. Works such as the installation of the Vehicle Restraint System (VRS) and acoustic barrier, resurfacing and installation of services will be done during lane/full road closures on the M4 if the nature of the works require this. The reduced scope of works realised by this alternative will reduce the exposure of site operatives to construction and traffic hazards and subsequently site risks. Careful staging of the works, risks assessments and safe working methodology will be required to limiting workers exposure to site risks such as working at height, adjacent to traffic, earthworks/embankments etc.

5.3 Pedestrian Safety

There will be occasions when access to the subway will need to be either restricted or closed to allow installation and maintain the safety of the public. These restrictions and closures are relevant to both the 2015 DCO Design and the 2021 NMC Design. However, the 2021 NMC Design for Sipson Road Subway offers a reduced works programme, and therefore will cause less impact to users of the subway.

6 Environmental Impact

A review of the potential environmental impact resulting from the 2021 NMC Design, with cross-reference to the Environmental Statement (ES) submitted in support of the DCO application and the environmental documentation submitted in the Examination, is discussed below.

The ES submitted in support of the DCO application assessed the following:

- Air Quality;
- Cultural Heritage;
- Landscape;
- Nature Conservation;
- Geology and Soils;
- Materials and Waste;
- Noise and Vibration;
- Effects on All Travellers;
- Community and Private Assets;
- Road Drainage and the Water Environment; and
- Cumulative Effects.

Following a review of the 2021 NMC Design, it has been determined that this Non-Material Change Application needs to consider the potential environmental impact on air quality, noise and vibration, biodiversity, landscape and visual, and water. These are discussed in further detail in the sections below.

It is considered that because there is no increase to construction procedures or any works outside order limits there would be no environmental impact as a result of the 2021 NMC Design on Cultural Heritage, Geology and Soils, Materials and Waste, Effects on All Travellers, or Community and Private Assets. Therefore, in relation to these topics, it is concluded that there are no changes to the assessment of residual effects presented in the ES, and therefore the assessments and conclusions presented in the ES remain valid. These topics are not considered further within this Non-Material Change Application.

As described in Appendix D of the Application Statement, a model verification exercise of the existing model setup has been undertaken against 2018 WebTRIS traffic data (including accounting for Tempro Growth) to evaluate the continuing use of the model and performance of its forecasting accuracy to inform the environmental assessments.

The findings of the model verification showed that across all explicitly modelled peak time periods the model provides a good match with the observed WebTRIS data (as detailed in Appendix D of the, Application Statement) and is therefore robust and suitable for continued use to assess the likely impacts of the Proposed changes to the Scheme for operational and environmental assessments.

Chapter 16 of the ES submitted in support of the DCO application considered combined and cumulative effects.

The former assessed the combined action of different environmental topic-specific impacts upon a single resource/receptor. Consideration of 'in-combination' effects is afforded within the topic change assessments below, where considered relevant.

The latter assessed the combined action of a number of different projects, cumulatively with the project being assessed, on a single resource/receptor. The list of developments included in the cumulative effects assessment was presented in Appendix 16.1 of the ES and was last updated in

January 2015 and developments that were accounted for in the traffic model was presented in Appendix 16.2. The locations of the developments were shown on Figure 16.1 of the ES.

A review of relevant planning portals was undertaken in March/April 2021 to determine if any additional developments not in previously considered locations (built or under construction only) within 1km of the 2021 NMC Design, which did not exist within the planning system in January 2015. Such developments would not have been considered in the cumulative effects assessment or the traffic modelling undertaken in support of the DCO application, and therefore, need to be considered for this Non-Material Change Application.

This review concluded that no new committed developments, meeting the selection criteria outlined in Chapter 16 of the ES, are present within 1km of the 2021 NMC Design. Therefore, the cumulative effects assessment and conclusions presented in the ES remain valid.

It should be noted that the ES submitted in support of the DCO application was produced in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009. The Regulations were updated in 2017, in accordance with EIA Directive 2014/52/EU, and require consideration of the following additional factors/topics not cited in the 2009 Regulations:

- Climate
- Population and human health
- Major accidents and disasters
- Heat and radiation.

Regarding climate, there are two aspects to consider i) impact of the 2021 NMC Design on climate (greenhouse gas emissions); and ii) vulnerability of the 2021 NMC Design to climate change (adaptation).

The 2021 NMC Design (predominantly through its drainage design which has taken account of the appropriate climate change allowances (20%)) has been designed to address vulnerability to climate change (adaption), and therefore vulnerability of the 2021 NMC Design to climate change (adaptation) is not considered further within this Non-Material Change Application.

The scheme assessed within the 2015 DCO did not include an assessment of embodied carbon as this was not a legislative requirement at the time of submission. However, as the Application is focussed on design changes to the overall scheme and that there is therefore no baseline to compare to and given that the scheme construction footprint will be less with the proposed design changes, it is assumed that no further assessment of this matter is required to be taken forward; and it is assumed to not be a factor that will affect the materiality of the change.

The change in horizontal alignment of the 2021 NMC Design does not impact traffic levels. Therefore, the impact of 2021 NMC Design on climate (greenhouse gas emissions) is not considered further within this Non-Material Change Application.

Regarding population and human health, a Health Impact Assessment was submitted at Deadline III of the DCO Examination, which was informed by the results of the air quality and noise assessments in the ES. Aspects of air quality and noise in respect of the Non-Material Change Application are considered in further detail in the sections below. As a result of the conclusions of that work, no further impacts to population and human health specifically are anticipated from the Non-Material Change Application.

Regarding major accidents and disasters, smart motorway schemes, like any major transport corridor, are considered to be potentially vulnerable to the following major man-made events:

- Industrial accidents such as the Buncefield fire affecting the M1;
- Road accidents involving the spillage of hazardous or polluting materials;

- Civil unrest or terrorist incidents; and
- Aviation accidents such as at East Midlands Airport.

In terms of natural hazards, those of relevance to a motorway relate to extreme adverse weather leading to unsafe driving conditions. Such events may lead to the spillage of fuel or other hazardous materials or those potentially damaging to the aquatic environment such as milk or other substances with a high biochemical oxygen demand.

None of the above major events would require a change to the design of a smart motorway scheme. Indeed, the very nature of a smart motorway scheme with the elevated level of motorway surveillance would mean that the response time to any such incidents would be enhanced and the changes within the Non-Material Change Application would not affect this.

In terms of both man-made and natural major accidents, the incremental environmental risk associated with a smart motorway scheme is the pollution of water quality. However, there is a low probability of a significant impact arising from a low probability major event.

The 2021 NMC Design is not considered vulnerable to risk of major events, nor is there considered to be any consequential changes in the predicted effects of the 2021 NMC Design on environmental factors. Therefore, major accidents and disasters is not considered further within this Non-Material Change Application.

Regarding heat and radiation, the scope of the 2021 NMC Design does not involve the use of radiation. Only under controlled conditions is heat used while the road pavement is laid. Consequently, heat and radiation is not considered further within this Non-Material Change Application.

6.1 Air quality

6.1.1 Introduction

A qualitative change assessment has been undertaken, comparing the 2015 DCO Design with the 2021 NMC Design with reference to the air quality assessment presented in Chapter 6 of the ES submitted in support of the DCO application.

6.1.2 Methodology

The change assessment has considered the potential for traffic changes to occur with the 2021 NMC Design including:

- Total daily flows (annual average daily traffic (AADT));
- Composition (percentage of heavy-duty vehicles (HDVs)); and
- Speed (daily average speed (kph)).

The traffic information used to underpin this assessment is as described in the introduction to Section 6 of this note. Where traffic AADT flows increase due to the 2021 NMC Design relative to the ES or the numbers of HDVs increase, this could be expected to cause a deterioration in air quality. Alternately, where either AADT flows or HDV numbers reduce with the 2021 NMC Design, this would be expected to improve air quality at nearby receptors. For speed changes, both improvements and deteriorations in air quality could occur. Whether an improvement or deterioration occurs is dependent upon at what speed any predicted variation occurs. In the case of motorway flows along the M4, as average daily speeds are typically high, a reduction in speed is likely to result in an improvement in air quality.

In order to consider whether a change in any of the traffic metrics may cause a perceptible change in air quality, the same traffic criteria as utilised in the ES have been utilised in this change

assessment. These are set out below and as taken from Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 'Air Quality' (HA 207/07):

- AADT flows will change by 1,000; or
- HDV (vehicles more than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more; or
- Daily average speeds will change by 10 km/h or more.

Under these criteria, only changes in traffic greater than these screening criteria are anticipated to cause a perceptible change in air quality. Any changes in traffic less than these criteria are considered not to be great enough to cause a perceptible change and are considered to be of negligible significance for air quality.

The change assessment has also considered the potential for changes in air quality to occur due to the 2021 NMC Design that could cause the location of vehicles to change. A reduction in the separation of the location of vehicles in running lanes to nearby sensitive receptors could cause a reduction in air quality compared to the predictions presented in the ES. Whilst an increase in separation may cause the converse and an improvement in air quality at nearby sensitive receptors. Whether a change in air quality that is perceptible is anticipated to occur from a change in running lanes location has been considered using the criteria below, taken from DMRB HA 207/07:

- Road alignment will change by 5m or more

Where a change in road width (i.e. running lane) is less than the above screening criteria, then the change in air quality associated with the variation is considered to be imperceptible and of negligible significance for air quality.

6.1.2 Change Assessment Findings

Construction

The scale of the works being undertaken for the 2021 NMC Design are very similar to those in the 2015 DCO Design. Therefore, the potential for adverse effects due to fugitive emissions of dust will be similar with both designs at the closest sensitive residential properties along Vine Way, Keats Way and also at Cherry Lane Children Centre and Cherry Lane Primary School on Sipson Road. As such, proposed mitigation measures included within the ES submitted in support of the DCO application and the Construction Environmental Management Plan will be sufficient to mitigate adverse effects on nearby receptors during the construction phase.

Operation

There are no changes in traffic flows associated with the 2021 NMC Design of Sipson Road Subway and therefore there are no effects on air quality at sensitive receptors due to changes in traffic flows.

The closest air quality sensitive receptors to the subway considered in the ES are located on Vine Close and Keats Way (including receptors B884-885, B938 and B940-941), to the north of the subway. As reported in the ES, annual mean concentrations of nitrogen dioxide (NO₂) of 31.9-33.1 µg/m³ were predicted at these receptors with the Scheme 2015 DCO Design in operation (Do Something), with a maximum increase of 0.1 µg/m³ compared to without the Scheme 2015 DCO Design (Do Minimum). This is well below the annual mean air quality objective of 40 µg/m³ with an imperceptible increase. The comparison of the 2015 DCO Design and the 2021 NMC Design shows the removal of a running lane at Sipson Road Subway of approximate 3m on the westbound side and 0.2m on the eastbound side. These changes are less than the 5m DMRB (HA 207/07) screening criteria.

6.1.3 Conclusion

There are no changes to the assessment of residual effects presented in the ES, and therefore the assessment and conclusions presented in the ES remain valid.

6.2 Noise and vibration

6.2.1 Introduction

A qualitative change assessment has been undertaken, comparing the 2015 DCO Design with the 2021 NMC Design with reference to the noise and vibration assessment presented in Chapter 12 of the ES submitted in support of the DCO application and the Enhanced Noise Mitigation Study Report submitted at Deadline VII and revised at Deadline VIII of the DCO Examination.

6.2.2 Changes in Baseline

Subsequent changes in traffic flows on the M4 and surrounding roads since the ES was submitted in support of the DCO application would affect the Do Minimum (i.e. without the scheme) and Do Something (i.e. with the scheme) traffic flows in similar ways.

Consequently, the negligible or minor noise level reductions reported in the ES and the Enhanced Noise Mitigation Study Report would still be evident and therefore the assessment and conclusions presented in both documents remain valid.

As shown in the ES and the Enhanced Noise Mitigation Study Report, there are negligible or minor noise level reductions with the scheme in operation. Consequently, there will be no adverse significant effects on any new committed developments within the Sipson Road Subway study area (although none have been identified) resulting from the implementation of the 2021 NMC Design, as there are no anticipated changes in traffic flows due to the Sipson Road Subway design changes.

6.2.3 Location and Sensitive Receptors

Figure 4, below, shows Sipson Road Subway and the surrounding area. There are residential areas to the north of the M4, to the east and west of Sipson Road. Additionally, Cherry Lane Children Centre and Cherry Lane Primary School lie directly to the north of the northern subway entrance. The closest receptors to the motorway are residential properties on Keats Way and Vine Close.

To the south of the M4, the nearest residential properties are on Sipson Road at a distance of approximately 400m from the south entrance to the subway.

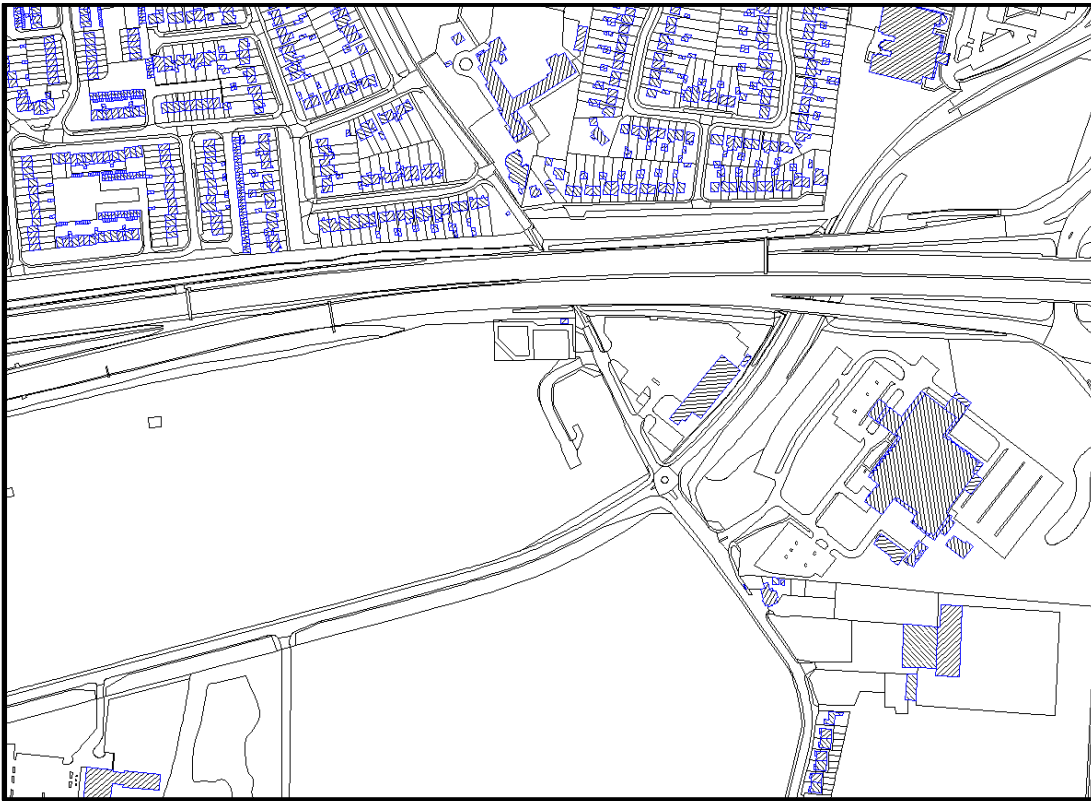


Figure 4 Sipson Road Subway and Surrounding Area

6.2.4 Change Assessment Findings

Construction Noise and Vibration

In the absence of mitigation, moving the subway works to the north of the motorway from the south of the motorway would increase construction noise and vibration levels to the nearest sensitive receptors on Keats Way and Vine Close and to Cherry Lane Children Centre and Cherry Lane Primary School.

Consequently, in order to reduce noise and vibration disturbance to the residents and the school on the north side, a precast solution will be employed rather than the originally proposed in-situ solution, which will result in substantially less intensive on-site works.

Additionally, by adopting the precast solution, it is expected that the construction works on site will be shortened by up to 3 months, not including the time saved by not carrying out the complex utility diversions that would have been required by widening the subway on the south side.

Consequently, it is concluded that adoption of the 2021 NMC Design will not result in significant changes to the overall construction noise and vibration disturbance to sensitive receptors (in the context of their location adjacent to motorway) in the vicinity when compared to the 2015 DCO Design.

Operational Noise

There are no anticipated changes in traffic flows due to the 2021 NMC Design of Sipson Road Subway.

The change in noise level at the nearest sensitive receptor to the north resulting from the adoption of the 2021 NMC Design over the 2015 DCO Design has been estimated and assessed.

The distance from the eastbound carriageway northern kerb to the nearest sensitive receptor will change from 48m to 47.8m. This will result in a noise level increase (due to noise from the eastbound carriageway) at the receptor of approximately 0.02 dB, a negligible increase.

The distance from the westbound carriageway northern kerb to the nearest sensitive receptor will change from 70 metres to 67 metres. This will result in a noise level increase (due to noise from the westbound carriageway) at the receptor of approximately 0.2 dB, a negligible increase.

The overall noise level increase (for both carriageways) has been estimated from the above and will be 0.1 dB, a negligible increase, which is assessed as not significant.

Sensitive receptors to the south will experience no change/negligible noise level decreases as a result of the 2021 NMC Design, which are assessed as not significant.

6.2.5 Conclusion

The qualitative change assessment has concluded that the 2021 NMC Design will not result in any significant construction noise and vibration level changes or operational noise level changes to surrounding receptors when compared with the 2015 DCO Design. It is therefore concluded that there are no changes to the assessment of residual effects presented in the ES, nor are there any changes to the assessment presented in the Enhanced Noise Mitigation Study Report, and therefore the assessment and conclusions presented in the ES and the Enhanced Noise Mitigation Study Report remain valid.

6.3 Biodiversity

6.3.1 Introduction

A qualitative change assessment has been undertaken, comparing the 2015 DCO Design with the 2021 NMC Design with reference to the ecology and nature conservation assessment presented in Chapter 9 of the ES submitted in support of the DCO application. The change assessment considered the potential impacts of changes to vegetation clearance on designated sites, habitats, and protected species.

Two sites of European importance to nature conservation were scoped into the impact assessment for the scheme; screening revealed no direct or indirect effects on these sites, their qualifying features, or their conservation objectives. The 2021 NMC Design changes are small scale in nature and do not materially alter the original assessments and there is no change to the conclusion of No Likely Significant Effect on these statutory designated sites. These sites have not been considered further in this assessment.

6.3.2 Methodology

The qualitative change assessment has been undertaken to enable direct comparison with the assessment presented in Chapter 9 of the ES.

The study area comprises the area within the Order limits around the 2021 NMC Design between chainages 14+300 and 14+425. The study area is limited to the northern approach of the subway and the northern side (eastbound) of the mainline, as the change in design created by the 2021 NMC Design is restricted to this area.

The change assessment has been undertaken in two stages:

- The first stage comprised a change assessment of the impacts of the 2021 NMC Design using the baseline ecological information that informed the ES, to enable a 'like for like' comparison of the effects of the 2021 NMC Design against the effects of the 2015 DCO Design.

- The second stage comprised a change assessment of the impacts of the 2021 NMC Design using the baseline ecological information that informed the ES, as well as any relevant updated ecological information collected since (up to 30 March 2021), to provide a current assessment of the potential effects of the 2021 NMC Design.

The following data sources have been consulted:

- Chapter 9 of the ES (and associated appendices and figures) submitted in support of the DCO application
- Ecological Constraints geodatabase (as of 30 March 2021) (A database that contains information collected pre-construction and by Ecological Clerks of Works during site clearance and construction)
- Vegetation Clearance drawings submitted at Deadline VII of the DCO Examination (514451-MUH-ML-ZZ-DR-SC-301252; Sheet 28; revision 6F 04/02/2016)
- 2021 NMC Design Vegetation Clearance Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5328; Sheet 28, 2022 revision P01)
- 2021 NMC Design Environmental Masterplan Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5256; Sheet 56; 2022 revision P01)

The change assessment considers impacts during construction only, as the 2021 NMC Design would not result in any significant changes to operational impacts.

The mitigation measures referred to in this change assessment are those secured through the made DCO, with consideration given as to whether any additional mitigation is required as a result of the 2021 NMC Design.

6.3.3 Change Assessment Findings

Summary of changes in relation to biodiversity

The 2021 NMC Design would result in no overall change to vegetation clearance.

A small area of temporary vegetation clearance along the western side of the subway approach from the north would no longer be required, but there would be a similar sized area of new temporary vegetation clearance along the eastern side of the subway approach. Additional habitats that would be temporarily lost comprise a small area of broad-leaved plantation woodland, which would be replanted with trees and shrubs.

Impact change assessment using DCO baseline ecological information

The ecological receptors within the study area assessed in the ES comprised habitats and plants, and birds. Table 1 below presents a summary of the assessment of the 2015 DCO Design presented in the ES and a change assessment of the 2021 NMC Design for these receptors using the DCO baseline ecological information.

The significance of residual effects of the 2021 NMC Design on habitats and plants, and on birds, when assessed against the DCO baseline ecological information is **neutral**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**neutral**).

The 2021 NMC Design would not contribute to any change to in-combination or cumulative effects.

The mitigation as listed in Table 1 and described within the ES remains appropriate and sufficient. These mitigation measures are included within the current version of the Construction Environmental Management Plan (as discharged under Requirement 8 of the DCO).

Impact change assessment using current baseline ecological information

Since the submission of the ES, no further ecological information has been recorded within the study area. Table 1 below presents a change assessment of the 2021 NMC Design using this current baseline ecological information.

The significance of residual effects of the 2021 NMC Design on habitats and plants, and on birds, when assessed against the current ecological baseline is **neutral**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**neutral**).

No additional committed developments were identified with potential for cumulative effects.

The 2021 NMC Design would not contribute to any change to in-combination or cumulative effects.

The mitigation as listed in Table 1 (below), and described within the ES, remains appropriate and sufficient. These mitigation measures are included within the current version of the Construction Environmental Management Plan (HA541451-BBV-EGN-GEN-MP-W-0001; 2021 revision 10).

6.3.4 Conclusion

The qualitative change assessment has concluded that the 2021 NMC Design will not result in any change to the significance of residual, in-combination, or cumulative effects on biodiversity receptors compared to the 2015 DCO Design, when assessed using either the DCO ecological baseline or the current ecological baseline. It is therefore concluded that there are no changes to the assessment of residual effects presented in the ES and therefore the assessment and conclusions presented in the ES remain valid.

Ecological receptor	Summary of ES assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline				Comments
	Value	Impact Description	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Value	Impact description	Mitigation	Significance of Residual Effect	
Habitats and plants	Local	Habitat loss Pollution	Minimising works areas Replanting Best practice pollution prevention and control	Neutral Habitat loss	Neutral Habitat loss (No overall change in area of habitat loss. Replanting in areas of temporary vegetation clearance would offset habitat loss and best practice pollution control measures would remain sufficient to avoid any other effects to surrounding retained habitats.)	None	Local	Habitat loss Pollution	Minimising works areas Replanting Best practice pollution prevention and control	Neutral Habitat loss (No overall change in area of habitat loss. Replanting in areas of temporary vegetation clearance would offset habitat loss and best practice pollution control measures would remain sufficient to avoid any other effects to surrounding retained habitats.)	
Birds	Local	Habitat loss	Seasonal avoidance (or pre-construction survey) Replanting	Neutral No residual effects	Neutral No residual effects (No change to effects on birds.)	None	Local	Habitat loss	Seasonal avoidance (or pre-construction survey) Replanting	Neutral No residual effects (No change to effects on birds.)	

Table 1: Biodiversity impact change assessment

6.4 Landscape and visual

6.4.1 Introduction

A qualitative landscape and visual impact change assessment comparing the change in design between the 2015 DCO Design and the 2021 NMC Design has been conducted.

The change assessment has considered the landscape and visual impacts of changes to vegetation clearance and planting proposals on sensitive receptors.

This was based on the assumption that the sensitive receptors could be most affected by changes in views of the motorway, due to additional vegetation clearance and therefore less mitigation planting and as an outcome, less visual buffer between the change and the sensitive receptor.

6.4.2 Methodology

The change assessment of landscape change between the 2015 DCO Design and the 2021 NMC Design has been undertaken in four stages:

Stage 1

Identify the landscape and visual effects of the 2015 DCO Design for this specific area using information presented in the following documents:

- Chapter 8: Landscape of the ES submitted in support of the DCO application, which provides information on the predicted temporary landscape and visual effects during construction, the predicted permanent landscape and visual effects during operation, and predicted cumulative effects.
- Appendix 8.3: Visual Effects Schedule of the ES submitted in support of the DCO application, which provides detailed information on the predicted visual effects during both construction and operation.
- Environmental Masterplan submitted at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016).

Stage 2

Compare the 2015 DCO Design identified on the Environmental Masterplan submitted at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016) with the relevant detailed landscape design shown on the ENGINEERING AND DESIGN REPORT, ENVIRONMENTAL MASTERPLAN (P01, S2, HA514451-CHHJ-ELS-SZ_ZZZZZZZZ_Z-DR-LD-5200 to 5265, 18/02/22) and vegetation clearance shown on the NON-MATERIAL CHANGE VEGETATION CLEARANCE (P01, S2, HA514451-CHHJ-ELS-SZ_ZZZZZZZZ_Z-DR-LD-5300 to 5331, 18/02/22) and identify any changes to vegetation clearance, landscape proposals and visual setting of sensitive visual receptors as a result of the 2021 NMC Design, using the baseline information presented in the ES.

Stage 3

Review the baseline information presented in the ES to determine any changes since the ES was published, focussing on the following sensitive receptors:

- Residential properties
- Business and institutional properties
- Listed Buildings
- Conservation Areas
- Scheduled Monuments
- National Character Areas (NCAs)
- Landscape Character Areas (LCAs)

- Landscape designations (e.g. AONB)
- Public rights of way (PRoW)
- National Trails.

Stage 4

Assess the impacts of the 2021 NMC Design against the current baseline (as of April 2021) in recognition that the baseline may have changed since the publication of the ES. Where the effects on the current baseline differ from the effects on the ES baseline (see Stage 2), provide an explanation of that change.

6.4.3 Change Assessment Findings

Stage 1

The following sensitive visual receptors, potentially impacted by the design change associated with the 2021 NMC Design, were identified in the ES and on the Environmental Masterplan submitted at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016), as illustrated on Figure 5:

- West Drayton urban area in which the subway is located - #1
- Residential properties on Keats Way (West Drayton) - #2
- Residential properties on Vine Close including Cherry Lane School (West Drayton) - #3



Figure 5 Aerial Image of change assessment area showing sensitive receptors

Figure 6 illustrates the area related to Sipson Road Subway on the Environmental Masterplan submitted in support of at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016).

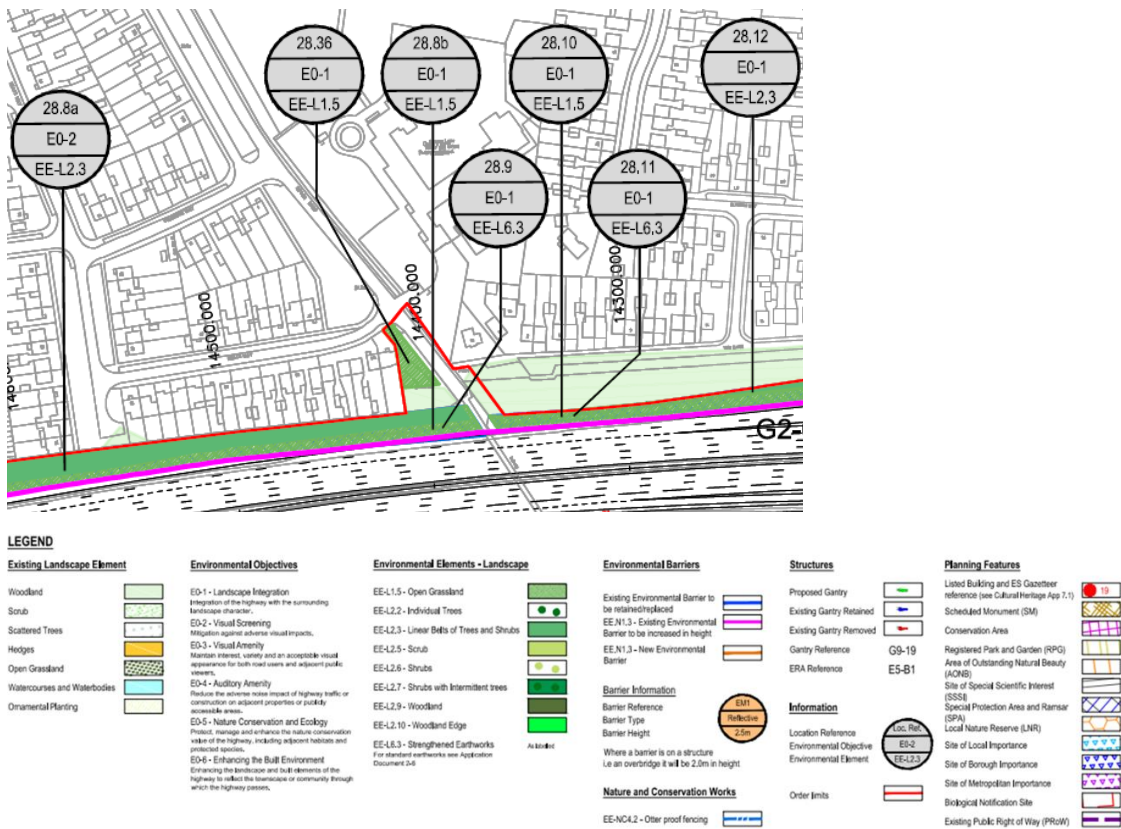


Figure 6 Extract of Environmental Masterplan submitted in support of at Deadline VIII of the DCO Examination (Version 11F, 29/02/2016)

The following residual visual effects were reported in the ES for Sipson Road Subway:

- During Construction: Slight adverse*
- Opening Year (Winter 2022): Slight adverse*
- Design Year (Summer 2037): Neutral*

Chapter 8 of the ES presented the assessment of the residual landscape and visual effects on a 'link by link' basis. Sipson Road Subway falls within the junction 4b to 4 – NCA 115 (Thames Valley) link. Table 2 below presents the residual effects assessment for junction 4B to 4 – NCA 115 (Thames Valley), taken from Table 8.2 of the ES.

	Impact Description	Receptor(s) Affected	Mitigation	Significance of Residual Effect
Scheme Link	Junction 4b to 4–NCA 115 (Thames Valley)			
Temporary Impacts (Construction)	Installation of gantries and EA, junction 4 eastbound off-slip road realignment and associated site clearance.	<p><u>Landscape receptors</u></p> <p>West Drayton urban area.</p> <p><u>Visual Receptors</u></p> <p>Residential properties on Keats Way and Vine Close (West Drayton).</p>	Construction best practice to minimise disruption, e.g. protection of retained existing vegetation, including important intervening tree belt between residential properties at the south edge of	<p><u>Landscape</u></p> <p>Slight adverse</p> <p><u>Visual amenity</u></p> <p>Moderate adverse</p>

	Impact Description	Receptor(s) Affected	Mitigation	Significance of Residual Effect
Scheme Link	Junction 4b to 4–NCA 115 (Thames Valley)			
			West Drayton and the M4.	
Permanent Impacts (Operation)	Presence of gantries in close proximity to residential properties such as G2-11, G2- 07 and G2-04.	<u>Landscape receptors</u> West Drayton urban area. <u>Visual receptors</u> Residential properties Keats Way (West Drayton).	Tree and shrub planting (EE L2.3) to replace the vegetation lost.	<u>Landscape</u> Slight adverse reducing over time to neutral . <u>Visual amenity</u> Moderate adverse in winter views from properties on Keats Way (West Drayton)
Cumulative Impacts	None identified	None affected	None required	Neutral

Table 2: Residual effects assessment for junction 4B to 4 – NCA 115 (Thames Valley), taken from Table 8.2 of the ES

Stage 2

The design change as a result of the 2021 NMC Design is restricted to the construction of a 1.2m wide retaining beam (supported on pile caps and piles) to the northern side (eastbound) of the M4 which has no impact on vegetation clearance or re-planting proposals. The only difference is the appearance of the beam on top of the subway entrance (refer to Figure 2 and 3 in Chapter 4).

Figure 7 illustrates the limit of the engineering works.

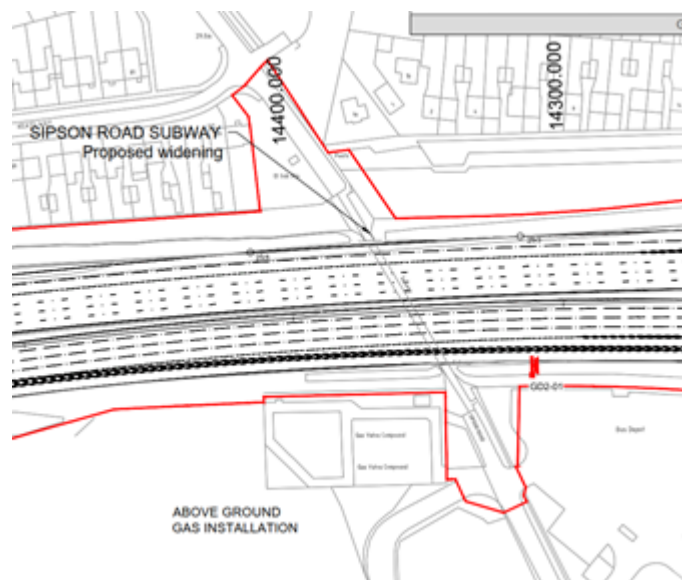


Figure 7 Extract of Engineering Design Sipson Road Subway North Widening Version C01 A, Issued for Construction Sipson Subway in GA drawing HA514451-CHHJ-HGN-SZ_MLZZZZZZ_Z-DR-CH-1088, 18/02/22

Figure 8 illustrates the extent of landscape proposals based on vegetation clearance requirements due to change of the engineering measures.



Figure 8 Extract of detailed landscape design shown on the ENGINEERING AND DESIGN REPORT, ENVIRONMENTAL MASTERPLAN (P01, S2, Sipson Subway in EMP drawing HA514451-CHHJ-ELS-SZ_ZZZZZZZ_Z-DR-LD-5256, 18/02/22)

A change assessment of the residual landscape and visual effects of the 2021 NMC Design against the baseline information presented in the ES is presented in Tables 3, 4 and 5 with a summary of the changes provided below.

Change to Vegetation Clearance

Construction works will be undertaken from the motorway side; therefore, now no vegetation clearance is required along the western side of the subway approach. On the eastern side of the approach, there is a small area of additional vegetation clearance required. However, the remaining existing vegetation is deep and mature enough to buffer the views from the residential area in the north of the subway.

Change to Landscape Proposals

The area of vegetation clearance on the eastern side of the approach will be replanted with tree and shrub planting (EE L2.3).

Change to Visual Amenity

West Drayton Urban Area: Overall no change to visual amenity for the West Drayton Urban Area as the views are limited over a restricted area.

Residential properties on Keats Way (West Drayton): No change to visual amenity for the residents at Keats Way as the remaining existing vegetation is deep and mature enough to buffer the views from the residential area in the north of the subway.

Residential properties on Vine Close (West Drayton): No change to visual amenity for the residents at Vine Close as the remaining existing vegetation is deep and mature enough to buffer the views from the residential area in the north of the subway.

Stage 3

After reviewing the area surrounding Sipson Road Subway Northern Approach, no changes to the baseline information presented in the ES have been identified.

Stage 4

Tables 3, 4 and 5 below present:

- The findings of the assessment of residual landscape and visual effects previously reported in the ES.
- The findings of the change assessment of residual landscape and visual effects of the 2021 NMC Design against the baseline information presented in the ES.
- A summary of any changes to the baseline information presented in the ES since the ES was published.
- The findings of the change assessment of residual landscape and visual effects of the 2021 NMC Design against the current baseline (as of April 2021).
- An explanation of any differences in the change assessment of effects on the current baseline when compared to the assessment of effects on the ES baseline.

Temporary Impacts during Construction

	Summary of ES Assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline			Comments
	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 4b to 4–NCA 115 (Thames Valley)									
Temporary Impacts (Construction)	Installation of gantries and ERA, Junction 4 eastbound off-slip road realignment and associated site clearance.	<u>Landscape Receptors:</u> West Drayton urban area. <u>Visual Receptors:</u> Residential properties on Keats Way (West Drayton). Residential properties on Vine Close (West Drayton).	Construction best practice to minimise disruption, e.g. protection of retained existing vegetation, including important intervening tree belt between residential properties at the south edge of West Drayton and the M4.	<u>Landscape</u> Slight adverse <u>Visual amenity</u> Moderate adverse	<u>Landscape</u> Slight adverse <u>Visual amenity</u> Moderate adverse (now no vegetation clearance is required along the western side of the subway approach. On the eastern side of the approach there is a small area of additional vegetation clearance required. However, the remaining existing vegetation is deep and mature enough to buffer the views from the residential area in the north of the subway)	No change to existing and no additional sensitive receptors have been identified	<u>Landscape</u> Slight adverse <u>Visual amenity</u> Moderate adverse (now no vegetation clearance is required along the western side of the subway approach. On the eastern side of the approach there is a small area of additional vegetation clearance required. However, the remaining existing vegetation is deep and mature enough to buffer the views from the residential area in the north of the subway)	Less re-planting on the western approach of the subway, slightly more re-planting on the eastern approach	<u>Landscape</u> Slight adverse <u>Visual amenity</u> Moderate adverse	The conclusion of the ES assessment remains valid

Table 3: Temporary Landscape and Visual Impacts during Construction

Permanent Impacts during Operation

	Summary of ES Assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline			Comments
	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 4b to 4–NCA 115 (Thames Valley)									
Permanent Impacts (Operation)	Presence of gantries in close proximity to residential	<p><u>Landscape Receptors:</u> West Drayton urban area.</p> <p><u>Visual Receptors:</u> Residential properties on Keats Way (West Drayton). Residential properties on Vine Close (West Drayton).</p>	Tree and shrub planting (EE L2.3) to replace the vegetation lost.	<p><u>Landscape</u> Slight adverse reducing over time to neutral.</p> <p><u>Visual amenity</u> Moderate adverse in winter views from properties on Keats Way (West Drayton) Moderate adverse in winter views from properties on Keats Way (West Drayton)</p>	<p><u>Landscape</u> Slight adverse reducing over time to neutral.</p> <p><u>Visual amenity</u> Moderate adverse (now no vegetation clearance is required along the western side of the subway approach. On the eastern side of the approach there is a small area of additional vegetation clearance required. However, the remaining existing vegetation is deep and mature enough to buffer the views from the residential area in the north of the subway)</p>	No change to existing and no additional sensitive receptors have been identified	<p><u>Landscape</u> Slight adverse reducing over time to neutral.</p> <p><u>Visual amenity</u> Moderate adverse (now no vegetation clearance is required along the western side of the subway approach. On the eastern side of the approach there is a small area of additional vegetation clearance required. However, the remaining existing vegetation is deep and mature enough to buffer the views from the residential area in the north of the subway)</p>	Less re-planting on the western approach of the subway, slightly more re-planting on the eastern approach	<p><u>Landscape</u> Slight adverse reducing over time to neutral.</p> <p><u>Visual amenity</u> Moderate adverse</p>	The conclusion of the ES assessment remains valid

Table 4: Permanent Landscape and Visual Impacts during Operation

Cumulative Impacts

	Summary of ES Assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline			Comments
	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect			Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 4b to 4–NCA 115 (Thames Valley)									
Cumulative Impacts	None identified	<u>Landscape Receptors:</u> None affected <u>Visual Receptors:</u> None affected	None required	<u>Landscape</u> Neutral <u>Visual amenity</u> Neutral	<u>Landscape</u> Neutral <u>Visual amenity</u> Neutral	None identified	<u>Landscape</u> None identified <u>Visual amenity</u> None identified	None required	<u>Landscape</u> Neutral <u>Visual amenity</u> Neutral	The conclusion of the ES assessment remains valid

Table 5: Cumulative Landscape and Visual Impacts

Summary

There are no changes to the assessment of temporary residual effects during construction presented in the ES as a result of the 2021 NMC Design when considering either the baseline information presented in the ES or the current baseline.

Additional vegetation clearance is negligible for West Drayton urban area, residential properties on Keats Way and Vine Close as the area around Sipson Road Subway entrance north is restricted and would not change the visual amenity for the sensitive receptors.

There are no changes to the assessment of permanent residual effects during operation presented in the ES as a result of the 2021 NMC Design when considering either the baseline information presented in the ES or the current baseline. Additional vegetation clearance is negligible for West Drayton urban area, residential properties on Keats Way and Vine Close as the area around Sipson Road Subway entrance north is restricted and would not change the visual amenity for the sensitive receptors.

There are no changes to the assessment of cumulative impacts presented in the ES as a result of the 2021 NMC Design when considering either the baseline information presented in the ES or the current baseline.

6.4.4 Conclusion

The 2021 NMC Design has been assessed against the baseline information presented in the ES and the current baseline (as of April 2021) and has been compared against the assessment of residual effects presented in the ES submitted in support of the DCO application.

It is concluded that there are no changes to the assessment of residual effects presented in the ES, and therefore the assessment and conclusions presented in the ES remain valid.

6.5 Water

6.5.1 Introduction

A qualitative change assessment of the 2021 NMC Design has been undertaken. Two aspects have been considered. The current water environment baseline has been appraised to identify any changes since the ES was submitted in support of the DCO application. The assessment has also considered whether there are any changes to the residual effects reported in Chapter 15 of the ES, interpreting whether these are due to changes in the baseline status of water environment receptors or due to the 2021 NMC Design.

6.5.2 Methodology

The change assessment has considered the potential for the 2021 NMC Design to cause:

- Changes to flood impacts due to a change in the footprint of works within the floodplain, as defined by Environment Agency Flood Zones 2 and 3 and/or a change to a proposed watercourse crossing. The 2015 Flood Zone extents have been reviewed against current (2021) flood maps available online¹.
- Changes to pollution effects from accidental spillages and routine runoff during operation because of changes to traffic flows and/or the proposed drainage design. The water quality of watercourses receiving discharges of runoff has been reviewed with reference to current (Cycle 2) Water Framework Directive data published online².

¹ Flood map for planning - GOV.UK (flood-map-for-planning.service.gov.uk)

² Environment Agency - Catchment Data Explorer

- Changes to groundwater due to a change in the footprint of works within a Source Protection Zone (SPZ) or overlying a Principal Aquifer.

6.5.3 Change Assessment Findings

Review of Baseline Conditions

The future baseline described in ES assumed improvements in surface and groundwater quality driven by implementation of the Water Framework Directive (WFD). However, review of the most recently available data shows that for the surface waterbodies local to Sipson Road, to the west of junction 4 (the River Colne and its tributaries), there has been no change or a degradation in some aspects of their water quality. The WFD groundwater body, the Lower Thames Gravels, is at the same chemical quality status as reported in the ES.

With regards to flood risk, there have been no changes to the spatial extents of Flood Zones 2 (medium risk) and 3 (high risk) in the vicinity of the 2021 NMC Design.

Changes in the baseline qualities of water environment receptors local to Sipson Road subway are therefore limited. The value/sensitivity assigned to receptors, in accordance with the criteria set out in Table 15.2 of the ES, would be the same or lower.

Review of Design Changes

The 2021 NMC Design is located within Environment Agency Flood Zone 1, defined as having an annual probability of flooding from rivers and the sea of less than 0.1%. The 2021 NMC Design will not affect any fluvial floodplains. No watercourses are crossed by the M4 at this location and the 2021 NMC Design does not change this. The effects of the 2021 NMC Design on flood impacts are therefore neutral.

There would be no changes to traffic flows due to the change in the design of Sipson Road Subway and therefore no change to the assessment presented in the ES of the risk of pollution of watercourses due to accidental spillages and from the discharge of routine runoff at this location.

In the ES, the significance of effects on water quality due to road drainage discharges was qualitatively assessed accounting for mitigation measures to ensure no deterioration compared to the baseline. As part of detailed design, road drainage discharges have been subject to DMRB HD 45/09 assessments incorporating HAWRAT to quantify pollution risks to surface and groundwaters.

However, at Sipson Road Subway, the DMRB HD 45/09 assessments are not applicable as the subway conveys a footpath/cycleway. There is no potential for pollution due to traffic accidents and routine runoff from the subway would not be contaminated by vehicular deposits of heavy metals etc. The 2021 NMC Design would not change the assessment presented in the ES of the risk of pollution of watercourses at this location.

Sipson Road Subway is not situated within a groundwater SPZ. The 2021 NMC Design comprises a subway extension to the north of the motorway and the underlying geology in this location does not support any Principal Aquifers. When compared to the assessment presented in the ES, the 2021 NMC Design has a neutral effect on groundwater.

6.6.5 Conclusion

It is concluded that there are no changes to the assessment of residual effects presented in the ES, apart from a minor beneficial change for groundwater, and therefore the assessment and conclusions presented in the ES remain valid.

7 Conclusion

The proposal to place a precast retaining beam over the northern entrance to Sipson Road Subway as opposed to widening on the southern side offers the most practical solution. The 2021 NMC Design reduces the risk of working next to services and avoids introducing a longitudinal joint in the carriageway. Overall, the 2021 NMC Design minimises disruption to the users of the subway, drivers, the environment, and associated services.

The 2021 NMC Design does not change the assessment of residual effects presented in the ES submitted in support of the DCO application, nor does it change the environmental documentation submitted in the Examination. Therefore, the assessment and conclusions presented in the ES remain valid.