

Smart Motorways Programme

M4 Junctions 3 to 12 Smart Motorway

Non-Material Change
Junction 8/9 No Through Junction Running
Technical Note

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1 Introduction

The M4 Junctions 3 to 12 Smart Motorway Scheme (the scheme) was developed in accordance with Interim Advice Note (IAN) 161/13. This IAN stipulated a default position that all junctions within an All Lane Running (ALR) scheme would implement Through Junction Running (TJR), except at motorway-motorway interchanges and terminal junctions. However, as scheme development continued, IAN 161/15 was released, and the scheme was able to implement elements of the updated IAN into its design. One of these elements was that each scheme should consider the best operating regime for each junction and not apply a scheme wide regime.

The traffic model was validated using observed traffic data and found to be suitable for continued use (as explained in Appendix C of the Application Statement). Predictions of traffic flows were provided to assess each junction for potential to operate with No Through Junction Running (No TJR). The review found that the most suitable operating regime at junction 8/9 is No TJR. This decision was accepted by the scheme's Safety Control Review Group (SCRG).

This Non-Material Change (NMC) technical note provides a summary of the analysis undertaken to inform the decision-making process on the most suitable operating regime at junction 8/9 of the scheme; and appraises the impact of those changes compared to the impacts reported at DCO stage for TJR.

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.

3 2015 DCO Design

The design upon which the DCO was granted implemented TJR. This did not require any structural works to the overbridges at the junction. However, modifications to the configuration of the slip roads was required to provide ALR.

4 Reasons for Proposed Change

Apart from motorway to motorway interchanges with free-flowing link roads, the default position for all junctions within an all lanes running scheme designed to IAN 161/13, was for the provision of TJR. Previous TJR appraisals were carried out in accordance with this principle. However, latest guidance in IAN 161/15 recommends schemes identify the “*most appropriate layout following analysis of the design year traffic flows and any operational or physical constraints*”.

The scheme was designed to IAN 161/13 and the operating regime was endorsed at Safety Control Review Group (‘SCRG’) in 2013. Therefore, the DCO to construct the scheme was granted on 2nd September 2016 on the basis that junction 5 would be widened to accommodate TJR.

As a result of updated guidance in IAN 161/15, a review into the most appropriate layout for junction 8/9 has been undertaken. The review has considered operational and physical constraints, extensive traffic modelling/forecasting and safety assessments, along with feedback from operational SM-ALR (All Lane Running) schemes.

The review found that the most suitable operating regime at junction 5 is No TJR or Dual 3 lane Motorway (D3M). This decision was accepted by the scheme’s SCRG and forms the basis of this NMC application.

This technical note summarises the analysis undertaken during this review.

5 Congestion Appraisal

An assessment of congestion at junction 8/9, based on data described in Section 6.1 has found that this junction does not have a congestion problem. It was found that there is slight congestion on the diverge slip roads in the AM and PM peaks. There is also some existing congestion on the eastbound merge slip road, however this is likely to be due to the existing ramp metering site.

6 Operational Appraisal of Junction 8/9

The aim of the appraisal was to determine the suitability of either a TJR or No TJR layout for the junction at the scheme design year (2037). Motorgraph plots, CCTV and observed congestion have been used to determine how junction 8/9 operates with the current layout and observed traffic flow, and to identify the cause of any observed congestion. The traffic model data has been used (in the manner described in the Traffic Technical Note) to identify potential suitable junction layouts based on peak hour forecast traffic flows for 2022 and 2037. The current congestion and operational characteristics have then been used to determine the most appropriate operational solution for junction 8/9 (in terms of optimising the junction layout and demonstrating it is the most effective layout).

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 Temporo Growth) to evaluate the continuing use of the model and performance of its forecasting accuracy to inform the operational and 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. In this section, traffic data has been plotted on charts to visualise forecast traffic growth and flows relative to the capacity of each link. For intra junction flows, TD22/06 “Layout of Grade Separated Junctions” specifies the maximum flow per lane for motorways as 1800 vehicles per hour (vph) per lane and therefore 5400vph for three lanes. The introduction of variable mandatory speed limits (VMSL) may allow up to 2000vph per lane, however, in reality the maximum throughput on any link is subject to a number of factors such as link length; merges and diverges; gradients; proportion of heavy goods vehicles (HGVs); weather conditions; etc. Furthermore, as flows approach the maximum capacity of a link there will be a tendency for speeds to reduce until flow breakdown occurs. Therefore, the appraisal of flows in this section should be seen as subjective, and maximum capacities should not be considered as a pass/fail criteria, instead, higher flows should be considered as having a greater risk of causing regular congestion.

6.1 Appraisal data

The congestion and operational appraisals have been undertaken using the data sources shown in Table 1.

Data	Source	Data Range	Purpose
Traffic flow data	WebTRIS (MIDAS Loops)	September 2013 & October 2017	Informs analysis of existing traffic flows
	M4 J3-12 Traffic Model (validated in 2019)	2013, 2022 and 2037	Informs analysis of forecast traffic flows
Motorgraph Plots (MTV)	TRL (Transport Research Laboratory)	November 2016	Informs analysis of traffic speeds and congestion seed points
CCTV monitoring	Highways England Traffic Camera Systems	Varied times throughout March 2019	Identification of cause of congestion and extent of lane specific queues
Congestion	Google Maps	Typical current weekday in March 2019	Informs analysis of slip road and local road network congestion

Table 1 Data sources used in congestion and operational appraisals of junction 8/9

6.2 Operation appraisal eastbound

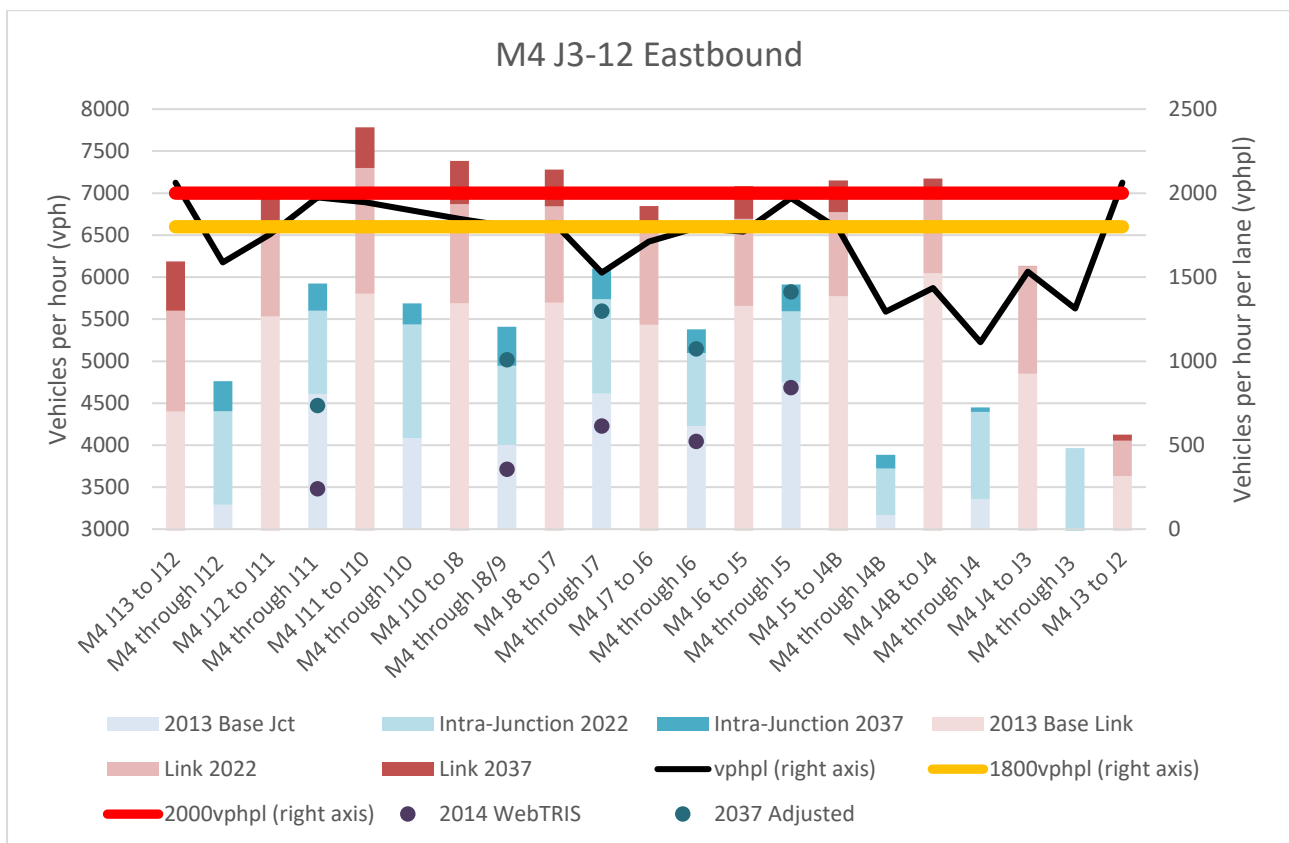


Figure 1 shows traffic data for the early AM peak from the validated traffic model (morning peak travel time period from 07:00 to 08:00) through junction 8/9 eastbound.

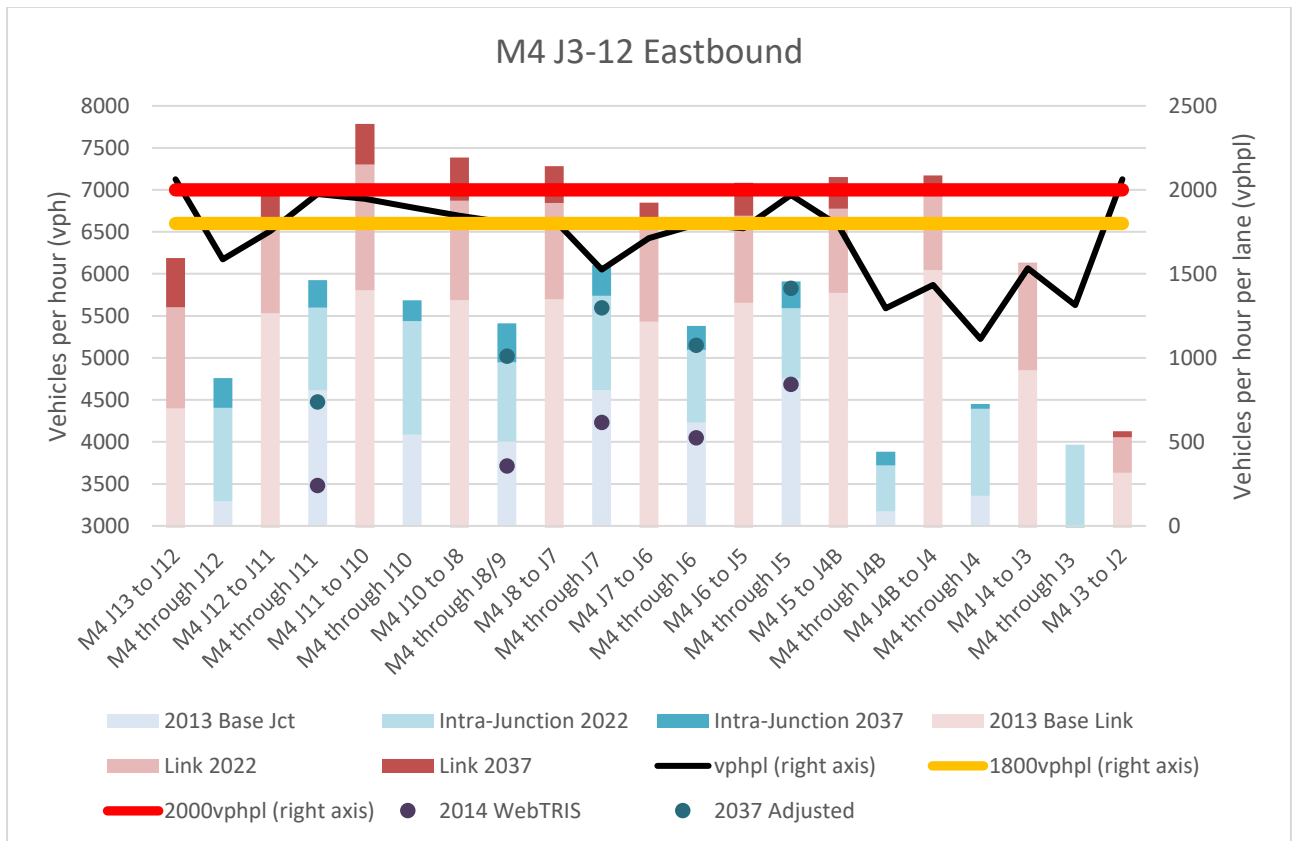


Figure 1 junction 8/9 Eastbound AM peak flows

The traffic model data indicates intra junction flow without TJR (three lanes) will be 4945 vehicles per hour (vph) (i.e. less than 1800 vph per lane) compared to 5070vph with TJR in the opening year (2022) and 5410 vph (i.e. marginally higher than 1800 vph per lane and less than 2000 vph per lane) compared to 5600 with TJR in the design year (2037). Flows on the upstream and downstream mainline links are also forecast to be approximately 1900vph per lane in 2037, indicating similar levels of risk of congestion as intra junction with No TJR or TJR.

Forecast flows for the merge and diverge in the design year are in excess of 1900vph, and therefore a lane drop/lane gain layout may be beneficial at this junction, which is technically motorway to motorway. The proposed lane drop layout enables an increased capacity for diverging traffic flow, to meet the requirements for the design year flow. This reduces the risk of congestion on the main carriageway, and therefore reduces the road user safety risks associated with congestion and late lane change manoeuvres. The lane drop/lane gain layout is different from the current merge / diverge layout as lane 1 on the upstream and downstream 4 lane ALR will become the slip road at the junction. With a conventional merge/diverge layout there is effectively a lane worth of traffic exiting and entering the M4 at the junction. Because of this, there is a risk that driver behaviour leads to very low usage of lane 1 through the junction with TJR. No existing significant congestion at the diverge slip roads has been identified at junction 8/9.

In summary, the proposed No TJR layout is operating within capacity limits and has potential safety benefits for road users approaching this junction.

6.3 Operation appraisal westbound

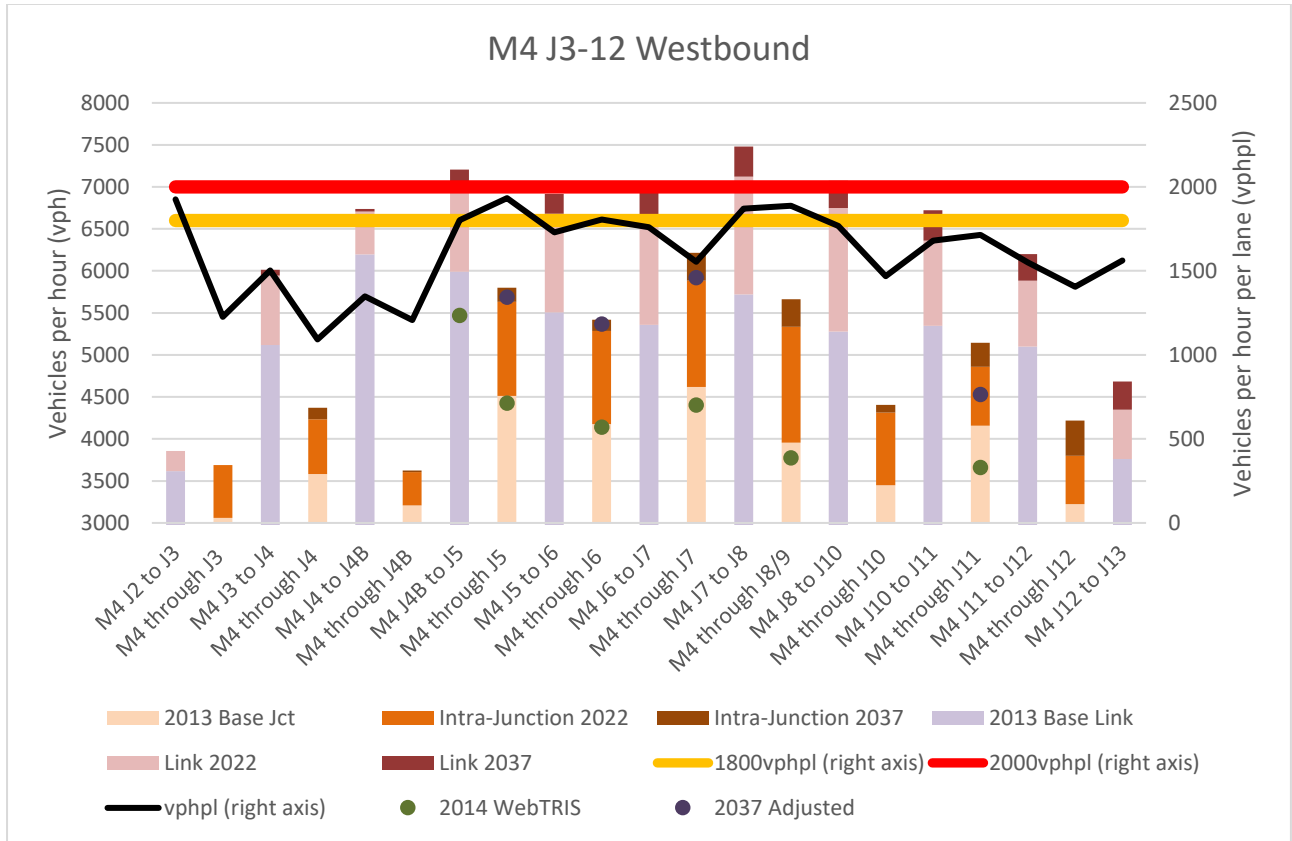


Figure 2 shows traffic data for the PM peak (afternoon peak travel time period from 17:00 to 18:00) peak through junction 8/9 westbound from the model.

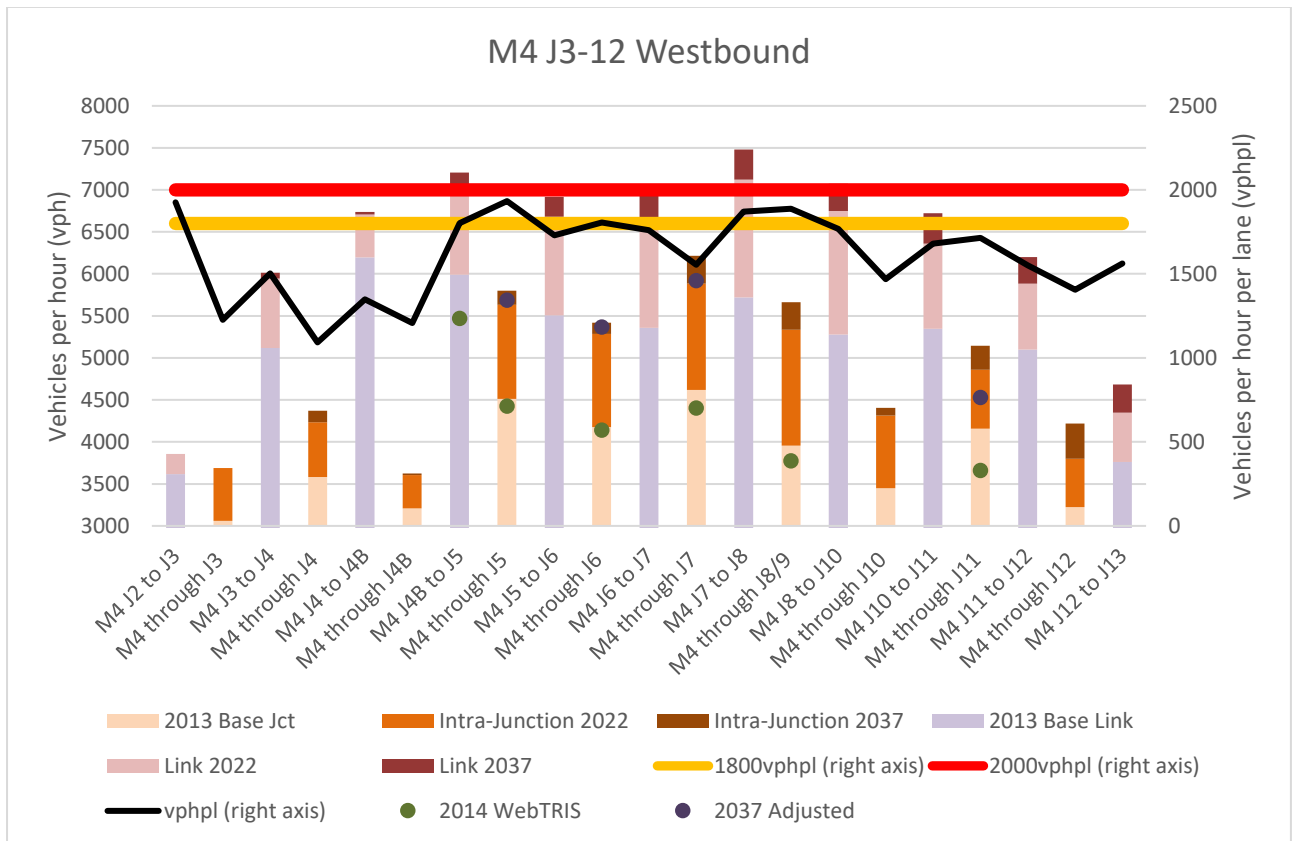


Figure 2 Westbound PM peak flows

The traffic model data indicates intra junction flow with No TJR (three lanes) will be 5335vph (i.e. less than 1800 vph per lane) compared to 5465vph with TJR in the opening year, and 5665vph with No TJR (i.e. less than 2000 vph per lane) compared to 5865vph with TJR in the design year. The design year intra junction flows are likely to have a higher risk of congestion in the PM peak with No TJR. However, flow on the upstream (junction 7-8) mainline link is forecast to be approximately 1900vph per lane in 2037, indicating similar levels of risk of congestion as intra junction with No TJR or TJR.

Intra junction observed flows (from WebTRIS loop data) are 3775 vph, approximately 180vph less than the base year 2013 traffic model, which could result in lower future flows than the current modelled forecast indicates.

Forecast flows for the merge and diverge in the design year are in excess of 1820vph, and therefore a lane drop/lane gain layout may be beneficial at this junction, which is technically motorway to motorway. The proposed lane drop layout enables an increased capacity for diverging traffic flow, to meet the requirements for the design year flow. This reduces the risk of congestion on the main carriageway, and therefore reduces the road user safety risks associated with congestion and late lane change manoeuvres. The lane drop/lane gain layout is different from the current merge / diverge layout as lane 1 on the upstream and downstream 4 lane ALR will become the slip road at the junction. With a conventional merge/diverge layout there is effectively a lane worth of traffic exiting and entering the M4 at the junction. Because of this, there is a risk that driver behaviour leads to very low usage of lane 1 through the junction with TJR. No existing significant congestion at the diverge slip roads has been identified at junction 8/9.

In summary, the proposed No TJR layout is operating within capacity limits and has potential safety benefits for road users approaching this junction.

7 2021 NMC Design

The DCO to construct the scheme was granted on 2nd September 2016 on the basis that junction 8/9 would be widened to accommodate TJR. The decision to implement No TJR at junction 8/9, based on operational and safety evidence, requires alterations to the scheme design and therefore the scheme's DCO. This section of the technical note summarises the changes in design of the scheme.

7.1 Junction layout

The junction is proposed to run as No TJR, also known as Dual 3 Lane Motorway (D3M). Three lanes and a hard shoulder in each direction will remain through at the intra junction. The retention of hard shoulder through the junction will provide a place of relative safety.

Both the westbound and eastbound diverges will be a Type D (Option 1) layout as per DMRB TD22/06 – a lane drop with ghost island. Currently both the westbound and eastbound diverges are Type A (option 2). The westbound and eastbound merges will be a Type F (Option 1) lane gain with ghost island. Currently westbound merge is Type A (Option 2) and eastbound merge is Type B. These will require pavement widening over significant lengths, although it will be a reduced width compared to the TJR design. The mainline will be resurfaced with a low noise thin surface course system.

New VRS will be provided on the slip roads and the mainline VRS design has been updated to reflect the No TJR scenario of a hard shoulder within the intra-junction.

7.2 Gantry changes

Gantry locations are primarily set by the datum point of the merge/diverge lanes at the junction, which have moved as a result of no longer implementing TJR. As a result, the gantry arrangement associated with junction 8/9 has required amendment.

This includes accounting for the fact that gantry positions were subject to limits of deviation outlined in the DCO as granted in September 2016 and some of the new locations are outside of these limits as shown on the Works Plans associated with the made DCO, noting that there is no limit of deviation for existing gantries which cannot be reused and need to be relocated.

Figure 3 shows a schematic of the previously proposed location/order of gantries on both approaches to junction 8/9, whereas Figure 4 shows the new proposed layout of junction 8/9 (with No TJR).

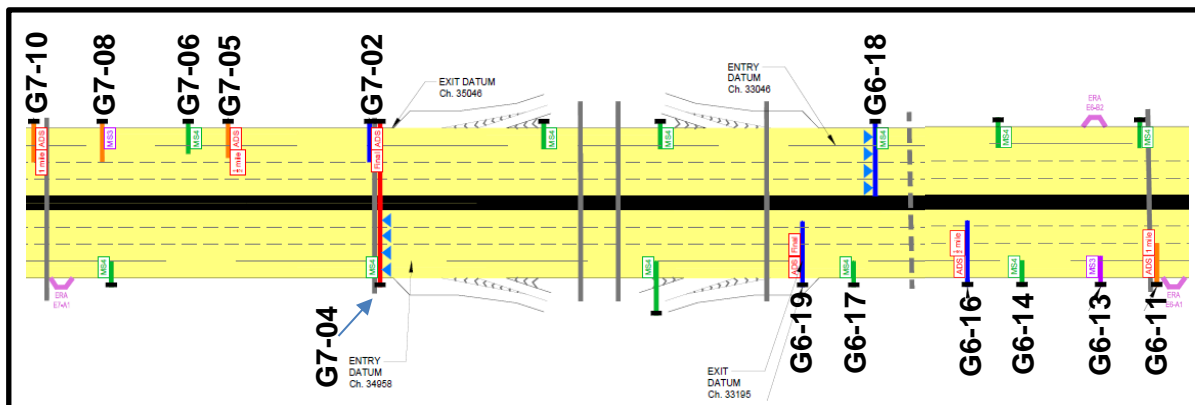


Figure 3 Schematic showing layout of junction 8/9 with TJR

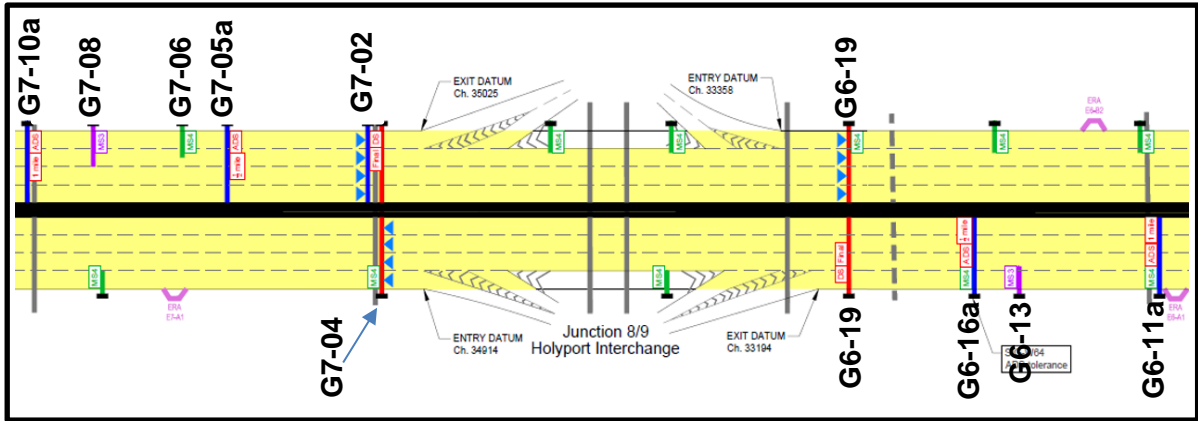


Figure 4 Schematic showing layout with junction 8/9 without TJR

The details eastbound and westbound gantries are provided in **Error! Reference source not found.** and Table 3 respectively. The changes to gantry location between TJR and No TJR are shown.

Gantry reference	New/existing	2017 location and type (TJR)	Current proposed location and type (No TJR)	Change to gantry	Outside Limit of Deviation	Reason for change
G7-10	Existing gantry to be Removed	36661 ADS cantilever	Gantry removed from scheme	Removed	NA	G7-10 removed from scheme, and replaced by G7-10a (moved 17m east)
G7-10a	Proposed	n.a.	36644 Super cantilever	New since discharge	Yes	Replacing G7-10, moving 17m east and changing from ADS cantilever to super cantilever
G7-05	Existing gantry to be Removed	35784 ADS cantilever	Gantry removed from scheme	Removed	NA	Removed from scheme and replaced by G7-05a
G7-05a	Proposed	n.a.	35776 Super cantilever	New since discharge	No	Replacing G7-05, moving 8m east and changing from ADS to Super cantilever
G7-02	Proposed	35146 Super cantilever	35156 Super cantilever	Location	Yes	Moved 10m west
G6-18	Proposed	32866 Super cantilever	Gantry removed from scheme	Removed	NA	MS4 from G6-18 added to G6-19

Table 2 Location and changes to eastbound junction 8/9 gantries

Gantry reference	New/existing	2017 location and type (TJR)	Current proposed location and type (No TJR)	Change to gantry	Move outside Limit of Deviation	Reason for change
G6-11	Existing gantry to be Removed	31553 ADS cantilever	Gantry removed from scheme	Removed	NA	G6-11 removed from scheme, and replaced by G6-11a (moved 9m west)
G6-11a	Proposed	n.a.	31562 Super cantilever	New since discharge	Yes	Replacing G6-11, moving 9m west to avoid proximity to bridge and changing from ADS cantilever to super cantilever
G6-13	Proposed	31805 MS3 cantilever	32156 MS3 cantilever	351m	Yes	Moved 351m west to location of removed gantry G6-14
G6-14	Proposed	32156 MS4 cantilever	Gantry removed from scheme	Removed	NA	Removed from scheme and replaced by G6-13 in same location, changing from MS4 cantilever to MS3 cantilever
G6-16	Existing gantry to be Removed	32439 ADS cantilever	Removed	Removed	NA	G6-16 removed from scheme, and replaced by G6-16a (moved 86m east)
G6-16a	Proposed	n.a.	32353 Super cantilever	New since discharge	Yes	Replacing G6-16, moving 86m east and changing from ADS cantilever to super cantilever to enable DMRB sign spacing compliance
G6-17	Proposed	32961 MS4 cantilever	Gantry removed from scheme	Removed	NA	Removed from scheme, with its MS4 moved onto G6-19
G6-19	Proposed	33193 Super cantilever	33062 Super-span portal	Moved 131 and changed type	Yes	Moved 131m east and changed from super cantilever to super-span portal (with extra MS4 from removed G6-19)
G7-04	Proposed	35100 Super-span portal	35097 Super-span portal	3m	No	Move 3m east

Table 3 Location and changes to westbound junction 8/9 gantries

7.3 CCTV and POP Changes

As a result of the changes to the junction design and gantry provision, changes are also required to the CCTV and Police Observation Posts located in and around Junction 5. Their changed position is shown on the plans accompanying the NMC application.

7.4 Drainage changes

The changes from the 2015 DCO drainage proposals as a result of implementing No TJR at the junction are described below:

East of Junction

Drainage in the eastbound merge and westbound diverge has changed from the 2015 DCO proposed slotted linear drainage channel to filter drain.

Further east of the slip roads, the eastbound and westbound verges maintain the 2015 DCO proposals of slotted linear drainage channel except a 150m section along the westbound verge where the existing kerb-and-gullies system is retained instead of implementing the DCO 2015 proposal of slotted linear drainage channel.

Intra-Junction

In the eastbound verge, the drainage proposals consist of retention of the existing filter drain, which was the same as the 2015 DCO proposals. In the westbound verge, the 2015 DCO proposed slotted linear drainage channel has changed to retention of the existing filter drain and there is a short section of new filter drain where it was not feasible to retain the existing filter drain.

West of Junction

Drainage in the westbound merge has changed from the 2015 DCO proposal of entirely slotted linear drainage channel to new filter drain with a 50m section of slotted linear drainage.

Further west of the slip roads in the eastbound and westbound verges, the majority of the existing filter drains proposed to be retained in the 2015 DCO has been replaced with new filter drains. In addition, there is a section of slotted linear drainage channels proposed in the 2015 DCO that has been retained in the westbound verge.

Central Reserve

In the central reserve, the drainage proposals remain as previously shown in the 2015 DCO, with new slotted linear drainage channel.

Summary

In summary, there are no significant changes to the 2015 DCO drainage proposals, with the greatest changes taking place at the junction slip roads and intra-junction where the slotted linear drainage channel proposed in the 2015 DCO has been replaced with filter drain.

7.5 Earthworks changes

7.5.1 2015 DCO Design

The 2015 DCO Design for junction 8/9 indicated earthwork widening was required over the extents, and via the geotechnical widening solutions, summarised below.

East of Junction

Eastbound Ch31800-33810 – No widening east of Ch33050 (approx.), with minor conventional (i.e. unreinforced) embankments and cuttings to the west of that chainage.

Westbound Ch31800-33810 – No widening east of Ch33200 (approx.), with minor conventional embankments and cuttings to the west of that chainage.

Intra-Junction

Eastbound – No widening.

Westbound – No widening.

West of Junction

Eastbound Ch34400-37000 – Conventional embankments and steepened reinforced soil embankments Ch34400-35030 (approx.), no widening elsewhere.

Westbound Ch34400-37000 – Minor conventional embankments Ch34690-34940 (approx.), no widening elsewhere.

7.5.2 2018 DCO Discharged Design

The 2018 DCO Discharged Design reflected improved design granularity and the acquisition of new and improved topographic data, which indicated narrower verges on the approaches to and through the junction than had previously been anticipated. This key finding resulted in a significant expansion of the areas of verge earthworks requiring widening throughout the junction and the additional requirement for more vertical retaining walls in order to keep the earthworks footprint within the available landtake. The outline details of the 2018 DCO Discharged Design are summarised below.

East of Junction

Eastbound Ch31800-33810 – Continuous widening via conventional embankments and (locally) steepened (1v:1.5h) embankments; vertical L-shaped concrete retaining walls at Emergency Area E6-B2 (Ch31800-31900), locally to signage gantry G6-15 (Ch32100-32300), at Ch32500-32700 and Ch33575-33605 due to landtake issues and at Bourne Culvert (Ch33820, approx.).

Westbound Ch31800-33810 (approx.) – Localised conventional embankments at signage gantries (only) to east of Ch32600, semi-continuous conventional embankments and (locally) cuttings west of that chainage; vertical steel sheet piled walls at signage gantries G6-17 (Ch32975) and G6-19 (Ch33150-33215) and vertical L-shaped concrete retaining wall above Bourne Culvert at Ch33800.

Intra-Junction

Eastbound – Conventional cutting (Ch34200-34330, approx.); vertical steel sheet piled wall at signage gantries G6-21 (Ch33850) and G7-01 (Ch34360).

Westbound – Conventional cutting (Ch34200-34390, approx.); vertical steel sheet piled wall at signage gantry G6-20 (Ch33860, approx.) and at build-out at Ch34180 (approx.).

West of Junction

Eastbound Ch34400-37000 (approx.) – Largely continuous conventional embankments and cuttings; vertical L-shaped concrete retaining wall Ch34675-34910 (approx.).

Westbound Ch34400-37000 (approx.) – Largely continuous conventional embankments and cuttings; vertical L-shaped concrete retaining wall above culvert at Ch34780 (approx.).

7.5.3 2021 NMC Design Changes

The 2021 NMC Design for junction 8/9 reflects the instructed switch to No TJR (ref previous Sub-sections herein). This has broadly resulted in a reduction in the width of the scheme alignment through the junction between Ch33000 and Ch34900, with a consequent reduction in the plan extents of the earthworks widening. Local changes to the provision and positioning of verge build-outs for signage gantries, Emergency Areas and communication infrastructure have also resulted in changes in the current earthworks solutions, compared to the 2018 DCO Discharged Design. The outline details of the 2021 NMC Design are summarised below.

East of Junction

Eastbound Ch31800-33810 – Continuous widening via conventional minor embankments and cuttings; vertical L-shaped concrete retaining walls replaced with vertical steel sheet piled walls, or with steepened embankments (Ch32500-32700, Ch33575-33605 and Ch33820, approx.); additional short vertical steel sheet piled walls at build-outs at Ch31930, Ch32030, Ch32680, and Ch32780; localised use of sub-vertical concrete slab-on-end retention across/adjacent to existing structures (Ch32150, Ch32230, Ch32310 and Ch32750-32850).

Westbound Ch31800-33810 – Continuous, minor conventional embankments and (locally) cuttings; vertical steel sheet piled walls at signage gantries G6-17 (Ch32975) replaced with minor embankment, and L-shaped wall above Bourne Culvert at Ch33800. Likewise additional vertical steel sheet piled walls at build-outs at Ch32030 and Ch32760-32800; localised use of sub-vertical concrete slab-on-end retention (Ch31930, Ch31980, Ch32340, Ch32725-32760, Ch32800-32825 and Ch32975).

Intra-Junction

Eastbound – Conventional cutting (Ch34200-34330); vertical steel sheet piled wall at signage gantries G6-21 (Ch33850) and G7-01 (Ch34360) replaced with vertical concrete slab-on-ends; sheet pile at build-out at Ch34000.

Westbound – Conventional cutting (Ch34200-34390); vertical steel sheet piled wall at signage gantry G6-20 (Ch33860) and at Ch34180 the build-out has been deleted.

West of Junction

Eastbound Ch34400-37000 – Generally continuous conventional embankments and cuttings with the vertical L-shaped concrete retaining wall at Ch34675-34910 deleted and replaced by embankment. Sub-vertical concrete slab-on-end walls behind build-out at Ch34740 (approx.) and at pylon at Ch34480 (approx.).

Westbound Ch34400-37000 (approx.) – Largely continuous conventional embankments and cuttings with the vertical L-shaped concrete retaining wall above the culvert at Ch34780 (approx.) deleted.

7.5.4 Change Summary

In summary, the key changes between the 2015 DCO Design and the 2021 NMC Design is the reduction of the areas requiring verge widening, resulting in the addition of more vertical retaining walls in order to ensure the earthworks footprint remains within the available landtake. These changes reflect improved design granularity (e.g. the fixing of verge build-out locations), and the acquisition of new and improved topographic data, which revealed the existence of narrower verges on the approaches to and through the junction than had previously been anticipated. In addition, vertical retention measures have been required in order to minimise floodplain losses due to earthworks widening, and so reduce requirements for flood volume compensation.

8 Safety

8.1 Driver and Non-Motorised user safety

The findings of the operational and congestion appraisal above have found that forecasted flows on the mainline are acceptable with No TJR and therefore would provide a safe environment for drivers. Furthermore, the provision of a hard shoulder intra-junction would also provide a place of relative safety for road users.

There is no non-motorised user (NMU) access in junction 8/9 so the proposed change to NTJR has no affect to NMUs.

A safety risk assessment comparing TJR and No TJR confirmed that No TJR has the potential to reduce exposure of road users to risks on the approach to junction 8/9.

Gantry changes have been assessed to ensure that all signs and signals located on these gantries can be seen clearly by drivers within the design standards for the scheme.

8.2 Workforce safety

Retaining the existing No TJR layout will significantly shorten the programme of works required and greatly reduce the complexity of the programme, therefore reducing the exposure of risk to road workers.

Changes to gantries are considered neutral, given the small amount of change. Existing procedures are in place for installation of all gantry types and this change does not present any new risk or procedures.

9 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 environmental documentation submitted to 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.

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).

In terms of the impact of the 2021 NMC Design on greenhouse gas emissions, analysis of No TJR impacts on the forecast traffic flows along the M4 corridor has shown a small reduction in traffic using the M4 relative to the TJR scenario. At an AADT level, removal of TJR at Junctions 5, 6, 8/9 and 11 has resulted in a reduction in the average traffic flow of less than 900 vehicles per direction, which equates to just over 1% reduction relative to the TJR scenario. The highest reduction in daily traffic (circa 2%) is predicted on the M4 stretch between Junction 8/9 and Junction 5. It is therefore considered that the climate impacts related to greenhouse emissions of the changes, would not be changed in any material way from the emissions arising from the consented Scheme, and if there were changes, they are likely to be a reduction.

At peak hour level, the biggest reductions are predicted in the AM peak, with reductions of around 200 vehicles per hour (circa 3%) on the eastbound section between Junction 8/9 and Junction 5 relative to the TJR scenario. A similar level of flow reduction is predicted between TJR and No TJR scenarios in the PM peak hour in the westbound direction between Junction 5 and Junction 8/9.

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 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.

Therefore, in light of the above, 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.

9.1 Air quality

9.1.1 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.

9.1.2 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 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.

9.1.3 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. 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 air quality sensitive receptors within 200m of the 2021 NMC Design.

The results of the traffic screening review indicate that at this location, changes in traffic for AADT, HDV and average daily speed are as set out in full in Table 4.

Traffic Data – through junction	Change due to 2015 DCO Design	Change with 2021 NMC Design	Differences between Datasets
AADT (veh/day)	+11,690	+9,434	-2,256
HDV (veh/day)	+314	+220	-94
Average Daily Speed (kph)	+2	-3	-5

Table 4 Comparison of Traffic Data between the ES (2015 DCO Design) and the 2021 NMC Design Datasets

The anticipated changes are all reductions. This indicates that air quality at nearby receptors may improve compared to the predictions in the ES. As the reduction in AADT flows is greater than the DMRB screening criteria, it is anticipated that a perceptible improvement in nearby receptors could occur, although the nearest receptors are more than 200m from the junction.

The comparison of the 2015 DCO Design and the 2021 NMC Design shows the removal of a running lane through junction 8/9. The approximate width of the removed running lane is 3.75m. This change is less than the 5m DMRB screening criteria; therefore, any change in air quality associated with this variation is expected to be imperceptible and of negligible significance.

9.1.4 Conclusion

The change assessment has identified that traffic changes are overall lower than those predicted for the ES and that changes provided by the 2021 NMC Design are negligible. Considered together, these changes are expected to result overall in a reduced impact on air quality compared to the assessment presented in the ES.

9.2 Noise and vibration

9.2.1 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.

9.2.2 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 junction 8/9 study area (although none have been identified) resulting from the implementation of the 2021 NMC Design, as the change to No TJR results in a reduction in noise levels – see Figure 6 below.

9.2.3 Location and Sensitive Receptors

Figure 5, below, shows junction 8/9 and the surrounding area. There are no sensitive receptors in close proximity to the junction.

There are substantial residential areas to the north west (distance > 700m), to the east (distance > 820m), to the south east (distance > 900m), with smaller residential areas to the south (distance > 850m). The closest sensitive receptors to the junction are Moor Farm and The Bourne (small residential area) at a distance of > 530m.

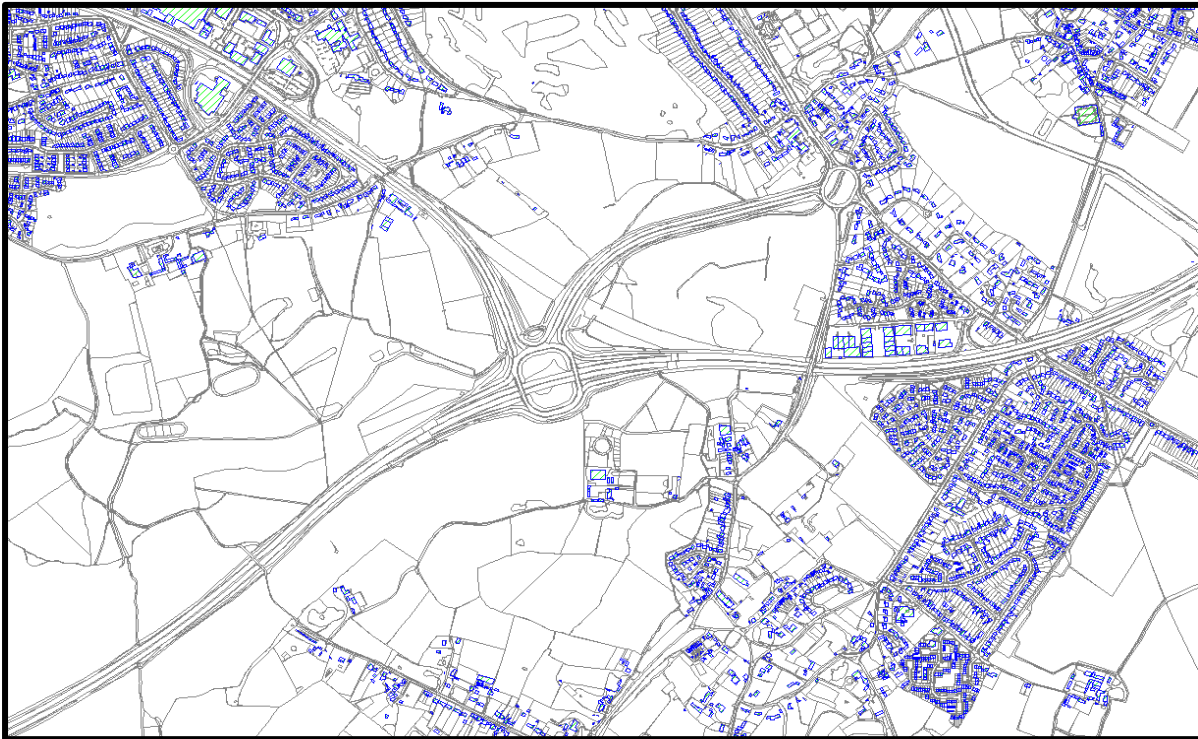


Figure 5 Junction 8/9 and Surrounding Area

9.2.4 Change Assessment Findings

Construction Noise and Vibration

Given that three lanes are being retained through the junction, the mainline works through the junction will be less intensive than for TJR. Consequently, surrounding sensitive receptors will not experience any additional significant effects as a result of the construction of the 2021 NMC Design compared to construction of the 2015 DCO Design.

Consequently, adoption of the 2021 NMC Design will not result in significant changes to the overall construction noise and vibration levels to sensitive receptors in the vicinity when compared to the 2015 DCO Design.

Operational Noise

The noise change assessment has employed the following scenarios along with their traffic data sets;-

- 1) Do Something 2022 With Through Junction Running (DS22 With TJR)
- 2) Do Something 2022 Without Through Junction Running (DS22 No TJR)

The traffic information used to underpin this assessment is as described in Section 6 of this note. The above scenarios have been implemented in a detailed computer noise model. The model has been used to calculate noise level contours within a study area around the 2021 NMC Design for each scenario, from which noise level changes between scenarios can be derived.

Figure 6, below, shows the noise level changes (DS22 No TJR) minus (DS22 With TJR).

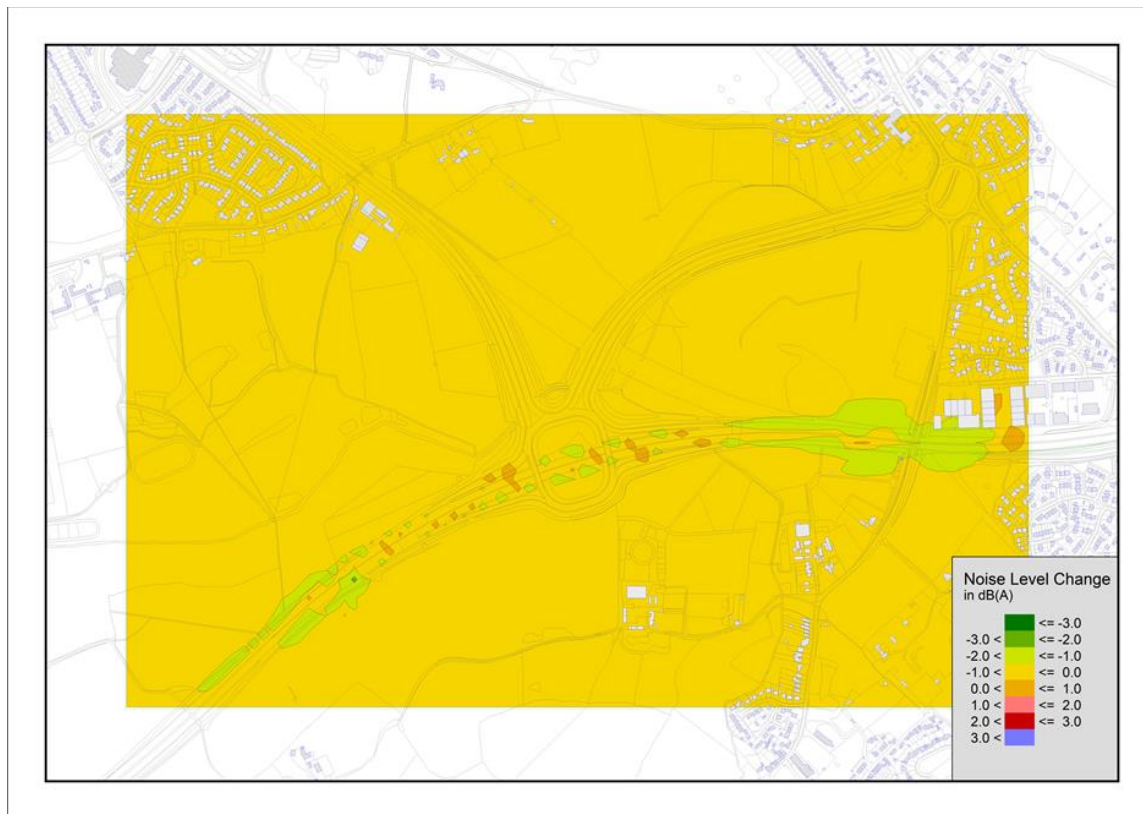


Figure 6 Noise level changes (DS22 No TJR) minus (DS22 With TJR)

It can be seen that there are generally negligible noise level decreases across the surrounding area as a result of adopting No TJR when compared with TJR.

It is noted that the long-term traffic flows (DS37 No TJR) show a similar trend to the short-term traffic flows (DS22 No TJR), when compared to the corresponding TJR traffic flows. As a result, there is no requirement to consider the long term-noise level changes separately.

Consequently, adoption of the 2021 NMC Design will not result in significant changes to the overall operational noise levels to sensitive receptors in the vicinity when compared to the 2015 DCO Design.

9.2.5 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.

9.3 Biodiversity

9.3.1 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.

9.3.2 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 30+800 and 37+100.

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 change 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-301240 to 514451-MUH-ML-ZZ-DR-SC-301243; Sheets 16 to 19; revision 6F 04/02/2016)
- 2021 NMC Design Vegetation Clearance Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5315 to ELS-SZ_ZZZZZZZZ_Z-DR-LD-5318; Sheets 15 to 18; 2022 revision P01)
- 2021 NMC Design Environmental Masterplan Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5230 to ELS-SZ_ZZZZZZZZ_Z-DR-LD-5236; Sheets 30 to 36; 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. Whilst the air quality change assessment (see Section 9.1) concludes a beneficial change in air quality with the 2021 NMC Design, this is not considered to be significant in relation to biodiversity as there are no sensitive designated site receptors within the 200 m threshold for potential significance.

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.

9.3.3 Change Assessment Findings

Summary of changes in relation to biodiversity

The 2021 NMC Design would result in an overall moderate increase in permanent and temporary vegetation clearance, mainly through additional strips of permanent and temporary vegetation clearance along the verges.

Additional areas of habitats that would be lost include small areas of semi-natural broad-leaved woodland, broad-leaved plantation woodland, scattered broad-leaved trees, dense scrub, scattered scrub, tall ruderal herbs, semi-improved neutral grassland, improved grassland, and poor semi-improved grassland. These areas are all located adjacent and parallel to existing carriageways and nearly all are only a few metres wide. The value of these areas to nature conservation is compromised by their small size, poor connectivity to other valuable natural habitats, high levels of disturbance, and lack of management. Areas of temporary vegetation clearance would be replanted with trees, scrub, shrubs, open grassland, and amenity grassland, which would offset most of the habitat loss.

Impact change assessment using DCO baseline ecological information

The ecological receptors within the study area assessed in the ES comprised designated sites, habitats and plants (including areas of ancient woodland), invasive plant species, amphibians, reptiles, birds, bats, otter (*Lutra lutra*) and badger (*Meles meles*). Table 5 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 designated sites, habitats and plants (including ancient woodland), invasive plant species, birds, bats, and otter when assessed against the DCO baseline would be **neutral**, which is no change from the assessment of the 2015 DCO Design (**neutral**).

The significance of residual effects of the 2021 NMC Design on amphibians, reptiles, and badger when assessed against the DCO baseline ecological information is **slight adverse**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**slight adverse**).

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

The mitigation as listed in Table 5 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, further information relating to invasive plant species, amphibians, reptiles, birds, bats, and badger has been recorded within the study area. Table 5 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 designated sites, habitats and plants (including ancient woodland), invasive plant species, birds, bats, and otter 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**).

The significance of residual effects of the 2021 NMC Design on amphibians, reptiles, and badger when assessed against the current ecological baseline is **slight adverse**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**slight adverse**).

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 5 (below), and described within the ES, remains appropriate and sufficient. Since publication of the ES, a great crested newt (*Triturus cristatus*) licence and a badger licence have been obtained for the scheme, and mitigation measures have been implemented to avoid any harm to great crested newts and badgers. Additionally, pre-construction checks and larger exclusion zones for kingfisher (*Alcedo atthis*) have been implemented to avoid any disturbance to nesting kingfishers. These mitigation measures are all included within the current version of the CEMP (as discharged under Requirement 8 of the DCO). The Construction Environmental Management Plan will be updated accordingly at the next six-month review.

9.3.4 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		
Designated sites	National (to local)	Pollution	Best practice pollution prevention and control	Neutral No residual effects	Neutral No residual effects (Best practice pollution control measures would remain sufficient to avoid any localised effects to Great Thrift Wood Site of Special Scientific Interest (SSSI), Bray Meadow SSSI, Bray Pennyroyal SSSI, Ockwells Park Local Nature Reserve (LNR), and Braywick Park LNR.)	None	National (to local)	Pollution	Best practice pollution prevention and control	Neutral No residual effects (Best practice pollution control measures would remain sufficient to avoid any localised effects to Great Thrift Wood SSSI, Bray Meadow SSSI, Bray Pennyroyal SSSI, Ockwells Park LNR, and Braywick Park LNR.)		
Habitats and plants	County (to local)	Habitat loss Pollution	Minimising works areas Replanting Best practice pollution prevention and control	Neutral Habitat loss	Neutral Habitat loss (Habitats to be lost are still considered to be of local value for nature conservation, and habitat loss, whilst slightly increased, is still minor. 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	County (to local)	Habitat loss Pollution	Minimising works areas Replanting Best practice pollution prevention and control	Neutral Habitat loss (Habitats to be lost are still considered to be of local value for nature conservation, and habitat loss, whilst slightly increased, is still minor. 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.)		

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 (ancient woodland)	National	No effects anticipated	None required	Neutral No residual effects	Neutral No residual effects (No change to effects on ancient woodland.)	None	National	No effects anticipated	None required	Neutral No residual effects (No change to effects on ancient woodland.)		
Invasive plant species	N/A	Spread	Species-specific control measures	Neutral No residual effects	Neutral No residual effects (Species-specific control measures remain sufficient to control spread of invasive plant species.)	Giant Hogweed (<i>Heracleum mantegazzianum</i>) recorded at 31+100 EB & WB Oak processionary moth (<i>Thaumetopoea processionea</i>) recorded from 36+100 to 36+300 EB; material cleared and left at 36+309 EB Indian (Himalayan) Balsam (<i>Impatiens glandulifera</i>) recorded at 34+925 WB, at approximately 25m north-west of Compound 5, and at 36+250 WB Indian (Himalayan) Balsam at 32+100 EB no longer present Variegated yellow archangel (<i>Lamium galeobdolon subsp. argentatum</i>) recorded at 32+440 WB	N/A	Spread	Species-specific control measures	Neutral No residual effects (Species-specific control measures remain sufficient to control spread of invasive plant species.)		

Amphibians	Local	Habitat loss	Pre-construction survey Phased vegetation clearance Seasonal avoidance	Slight adverse Minor permanent loss of habitat	Slight adverse Minor permanent loss of foraging habitat (Still considered to be minor due to low value and small areas of habitats to be lost.) (Phased vegetation clearance would remain sufficient to avoid direct mortality.)	Pond New CL with assumed great crested newt presence recorded approximately 300m south of the scheme at 36+675 Pond 56 now with positive eDNA result for great crested newt (previously not surveyed), located approximately 350m south of the scheme at 36+425 Pond New BE with positive eDNA result for great crested newt recorded approximately 350m south of the scheme at 35+200 Pond New BC with assumed great crested newt presence recorded approximately 175m south of the scheme at 35+100 Pond 48 now with positive eDNA result for great crested newt (previously average habitat suitability index assessment result), located approximately 375m south of the scheme at 34+400 Low great crested newt mitigation risk zones present between 37+800 - 36+050 WB,	Local	Habitat loss	Pre-construction survey Phased vegetation clearance Seasonal avoidance	Slight adverse Minor permanent loss of foraging habitat (Still considered to be minor due to low value and small areas of habitats to be lost.) (Ponds New CL, 56, New BE, New BC, and 48 were included on the contractor's great crested newt licence (2018-35524-EPS-MIT) granted in 2018, which includes the agreed mitigation solution. In the licence and the CEMP, phased vegetation clearance includes provision for hand searches of refugia in high and medium risk zones. This would remain sufficient to avoid direct mortality.)	
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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	
						35+275 - 35+575 WB, and 34+200 -34+950 WB Medium great crested newt mitigation risk zone present between 34+950 - 35+275 WB					
Reptiles	Local	Habitat loss	Displacement Translocation	Slight adverse Displacement and translocation of individuals Minor permanent loss of foraging habitat	Slight adverse Displacement and translocation of individuals (Phased vegetation clearance or translocation would remain sufficient to avoid direct mortality.) Minor permanent loss of foraging habitat (Still considered to be minor due to low value and small areas of habitats to be lost.)	Suitable and highly optimal reptile habitat recorded between: 34+050 - 34+200 WB (within J8/9) 34+200 - 34+950 WB Suitable but sub-optimal reptile habitat recorded between: 37+000 - 37+100 EB 36+800 - 36+900 WB 35+600 - 35+800 WB 35+500 - 35+600 EB 35+400 - 35+500 WB 33+850 - 34+000 EB 33+400 - 33+600 WB 33+275 - 33+325 WB Habitat downgraded to no reptile suitability: Construction Compound 5 30+800 and 31+800 WB	Local	Habitat loss	Displacement Translocation	Slight adverse Displacement and translocation of individuals (Phased vegetation clearance or translocation would remain sufficient to avoid direct mortality.) Minor permanent loss of foraging habitat (Still considered to be minor due to low value and small areas of habitats to be lost.)	

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		
Birds	Local	Habitat loss	Seasonal avoidance (or pre-construction survey) Replanting	Neutral No residual effects	Neutral No residual effects (Replanting would offset habitat loss.)	Suitable kingfisher habitat recorded between 32+050 - 32+080 EB & WB (The Cut)	Local	Disturbance while breeding (certain species only, including kingfisher) Habitat loss	Seasonal avoidance (or pre-construction survey) Replanting	Neutral No residual effects (Pre-construction survey in the CEMP includes provision for exclusion zones if any bird nests are found, with larger zones specified for kingfisher.) (Replanting would offset habitat loss.)		

Bats	Local	<p>Disturbance (foraging/ commuting)</p> <p>Habitat loss</p>	<p>Pre-construction survey</p> <p>Seasonal avoidance</p> <p>Avoidance of night working</p> <p>Minimising light spill</p> <p>Replanting</p>	<p>Neutral</p> <p>No residual effects</p>	<p>Neutral</p> <p>No residual effects (Replanting would offset habitat loss.)</p>	<p>Tree X052 (1), (2), (5), and (6) with high bat roost suitability recorded at 35+050 EB</p> <p>Tree X052 (7) with moderate bat roost suitability recorded at 35+050 EB</p> <p>Tree X50C with moderate bat roost suitability recorded at 34+400 EB</p> <p>Two trees between 33+750 and 33+850 WB downgraded to low bat roost suitability</p> <p>Tree 2021-TEC-01 with high (precautionary) bat roost suitability recorded at 33+775 WB</p> <p>Tree X187 with moderate bat roost suitability recorded at 33+550 EB</p> <p>Tree X040 with high bat roost suitability recorded at 32+450 EB</p> <p>Tree X036 with moderate bat roost suitability recorded at 32+210 WB</p> <p>Tree X035a with high bat roost suitability recorded at 32+100 WB</p>	County (to local)	<p>Disturbance (within roost)</p> <p>Disturbance (foraging / commuting)</p> <p>Habitat loss</p>	<p>Pre-construction survey</p> <p>Seasonal avoidance</p> <p>Avoidance of night working</p> <p>Minimising light spill</p> <p>Replanting</p>	<p>Neutral</p> <p>Limited and temporary disturbance (Disturbance from works at The Bourne Culvert and Cut Bridge would not be significant. Mitigation measures remain sufficient to avoid significant impacts, and thereby not require a bat European Protected Species licence.)</p> <p>(Replanting would offset habitat loss.)</p>	
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						<p>Tree X031A with moderate bat roost suitability recorded at 31+200 WB</p> <p>Junction 8/9 Holyport Interchange Overbridge West at 34+180 upgraded to moderate bat roost suitability</p> <p>Junction 8/9 Holyport Interchange Overbridge East, with moderate bat roost suitability, recorded at 34+000</p> <p>The Bourne Culvert at 33+820 upgraded to a potential bat roost</p> <p>Flood Culvert 1 (West) at 32+350 upgraded to high bat roost suitability</p> <p>Flood Culvert 2 (Middle) at 32+225 upgraded to moderate bat roost suitability</p> <p>Flood Culvert 3 (East) at 32+100 upgraded to high bat roost suitability</p> <p>Cut Bridge at 32+080 upgraded to a confirmed bat roost</p> <p>Thames Bray, with high bat roost suitability, recorded at 31+240</p>					
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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	
Otter	Local	Disturbance (foraging/ commuting) Pollution	Minimising night working Minimising light spill Maintaining free passage Best practice pollution and prevention control	Neutral Minimal disturbance (foraging/ commuting)	Neutral Minimal disturbance (foraging/ commuting) (No change to effects on otter.)	None	Local	Disturbance (foraging/ commuting) Pollution	Minimising night working Minimising light spill Maintaining free passage Best practice pollution and prevention control	Neutral Minimal disturbance (foraging/ commuting) (No change to effects on otter.)	

Badger	Local	<p>Loss of sett</p> <p>Displacement of individuals</p> <p>Disturbance</p> <p>Habitat loss</p>	<p>Exclusion</p> <p>Provision of artificial sett</p> <p>Seasonal avoidance</p> <p>Replanting</p>	<p>Slight adverse</p> <p>Displacement of individuals</p> <p>Disturbance</p>	<p>Slight adverse</p> <p>Displacement of individuals</p> <p>Disturbance</p> <p>(Replanting would offset the majority of habitat loss.)</p>	<p>Setts B3, B4, B5, and B7, all active annexe setts, sett B8, a disused outlier sett (now closed), and sett B6, an active main sett, recorded between 36+800 - 36+900 EB</p> <p>Sett 17 at 36+675 WB scoped out</p> <p>Sett 16A, a disused outlier sett, recorded at 36+600 WB</p> <p>Sett BatTreeAutumn16A, an active main sett, recorded between 34+910 - 34+975 EB</p> <p>Setts 11, 12, 13 and 15, all partially used outlier setts, between 35+100 and 34+400 EB, either no longer present or scoped out</p> <p>Sett 118, a disused outlier sett (now closed), recorded at 34+175 WB</p> <p>Sett 119, a disused outlier sett, recorded at 34+100 WB</p> <p>Sett BAD14 and sett 141, both disused outlier setts, sett BAD15-1_12, an active main sett, sett BAD15-13_14, an active outlier sett, sett BAD16, an active subsidiary sett, all</p>	Local	<p>Loss of setts</p> <p>Displacement of individuals</p> <p>Disturbance</p> <p>Habitat loss</p>	<p>Exclusion</p> <p>Provision of artificial sett</p> <p>Seasonal avoidance</p> <p>Replanting</p>	<p>Slight adverse</p> <p>Displacement of individuals</p> <p>Disturbance</p> <p>(Sett BAD17, sett C-1_17, Sett 132, sett 07a, sett 101, sett 134-01, sett 134-06, sett 134-07, sett 134_02, sett 006, and sett 136 were included on the contractor's badger licence (2018-35576-SPM-NSIP1) granted in 2018, which includes the agreed mitigation solution, including provision for an artificial sett.)</p> <p>(Replanting would offset the majority of habitat loss.)</p>	
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						<p>recorded between 32+390 - 32+650 EB</p> <p>Sett BAD17, an active outlier sett (now closed), recorded at 32+230 EB</p> <p>Sett C-1_17, an active subsidiary sett (now closed), recorded at 31+960 EB</p> <p>Sett C-18, a disused outlier (now closed), recorded at 31+890 EB</p> <p>Sett 132, an active annexe sett (now closed), recorded at 31+930 WB</p> <p>Sett 07a, an active outlier sett (now closed), recorded at 31+750 WB</p> <p>Sett 101, an active subsidiary sett (now closed), recorded at 31+680 EB</p> <p>Sett 134-01, an active outlier sett (now closed), recorded at 31+575 WB</p> <p>Setts 134-06 and 134-07, both active outlier setts (now closed), recorded between 31+525 - 31+590 EB</p> <p>Sett 134_02, an active subsidiary sett (now closed), recorded at 31+500 WB</p>				
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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	
						Sett 006, an active main sett, at 31+150 EB, now closed Sett 136, an active annexe sett (now closed), recorded at 31+010 EB					

Table 5 Biodiversity impact change assessment

9.4 Landscape and visual

9.4.1 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.

9.4.2 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.

9.4.3 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 7 (from west to east):

- Paley Street Farm Overbridge (western end) - #1
- Junction 8/9 - #2
- Ascot Road Overbridge - #3
- Old Marsh Lane Underbridge (eastern end) - #4

The following sensitive visual receptors were identified within the ES:

- Rural residential properties at Paley Street - #5
- Residential properties between Ascot Road Overbridge and Chainage 32-400, EB and WB - #6
- PRoWs west of Junction 8/9 - #7
- PRoWs at Monkey Island Overbridge - #8
- Ockwells Park LNR - #9
- Holyport Conservation Area - #10



Figure 7 Aerial Image of assessment area showing sensitive receptors as identified in the ES

Chapter 8 of the ES presented the assessment of the residual landscape and visual effects on a 'link by link' basis. Junction 8/9 falls within the links of junction 10 to 8/9 – NCA 115 (Thames Valley) and junction 8/9 to 7 – NCA 115 (Thames Valley).

Table 6 below presents the residual effects assessment for junction 10 to 8/9 and junction 8/9 to 7, taken from Table 8.2 of the ES.

	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect
Scheme Link	Junction 10 to 8/9 – NCA 115 (Thames Valley) and Junction 8/9 to 7–NCA 115 (Thames Valley)			
Temporary Impacts (Construction)	Construction impacts resulting from overbridge realignments, earthworks strengthening and new gantries.	Landscape receptors: LCA 6a: Braywoodside. LCA 8b: Ockwells LCA 14b: Bray. Visual Receptors: Rural residential properties at Paley Street Residential properties between Ascot Road Overbridge and Chainage 32-400, EB and WB PRoWs west of Junction 8/9 PRoWs at Monkey Island Overbridge Ockwells Park LNR Holyport Conservation Area	Construction best practice to minimise disruption, e.g. protection of retained existing vegetation, including trees covered by TPOs or within conservation areas lying immediately adjacent to the Order limits.	Landscape Moderate adverse on landscape Slight adverse the urban area Visual amenity Moderate adverse to major adverse
Permanent Impacts (Operation)	overbridges and associated earthworks, engineered embankment slopes and gantries either on top of embankments or in close proximity to residential properties	Landscape receptors: None affected. Visual Receptors: Rural residential properties at Paley Street Residential properties between Ascot Road Overbridge and Chainage 32-400, EB and WB PRoWs west of Junction 8/9	Woodland (EE L2.9) and new tree and shrub planting (EE L2.3) to replace the vegetation lost.	Landscape Slight Adverse Visual amenity Slight adverse reducing over time to neutral for rural residential properties at Paley Street. Moderate adverse reducing overtime to slight adverse for users of PRoW in the vicinity of

	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect
Scheme Link	Junction 10 to 8/9 – NCA 115 (Thames Valley) and Junction 8/9 to 7–NCA 115 (Thames Valley)			
		PRoWs at Monkey Island Overbridge Ockwells Park LNR Holyport Conservation Area.		Stud Green Access overbridge Slight adverse reducing to neutral for users of other PRoW within the rural area.
Cumulative Impacts	None identified	None affected	None Required	Neutral

Table 6 Residual effects assessment for junction 10 to 8/9 and junction 8/9 to 7, taken from Table 8.2 of the ES

Stage 2

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 7, 8 and 9 with a summary of the changes provided below.

Changes to Vegetation Clearance

Rural residential properties at Paley Street: Minor additional vegetation clearance on the westbound close to the footbridge. However, M4 lies in a cutting and therefore properties will not be affected by clearance.

Residential properties between Ascot Road Overbridge and Chainage 32-400, eastbound and westbound: No additional vegetation clearance.

Public Rights of Ways west of Junction 8/9: Minor additional vegetation clearance on the eastbound close to the footpaths.

Public Rights of Ways at Monkey Island Overbridge: No additional vegetation clearance.

Ockwells Park LNR: No additional vegetation clearance.

Holyport Conservation Area: No additional vegetation clearance.

Changes to Landscape Proposals

Although minor additional vegetation clearance in some places, the landscape proposals provide mitigation planting to ensure that screening to sensitive receptors is provided.

Changes to Gantries-Visual Setting

G6-19: now closer to residential properties.

All other gantries: no change to original assessment.

Stage 3

After reviewing the area east and west of the 2021 NMC Design, no changes to the baseline information presented in the ES have been identified.

Stage 4

Tables 7, 8 and 9 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 10 to 8/9 – NCA 115 (Thames Valley) and Junction 8/9 to 7–NCA 115 (Thames Valley)									
Temporary Impacts (Construction)	Construction impacts resulting from overbridge realignments, earthworks strengthening and new gantries.	<u>Landscape Receptors:</u> LCA 6a: Braywoodside LCA 8b: Ockwells LCA 14b: Bray <u>Visual Receptors:</u> Rural residential properties at Paley Street Residential properties between Ascot Road Overbridge and Chainage 32-400, EB and WB PRoWs west of Junction 8/9 PRoWs at Monkey Island Overbridge Ockwells Park LNR Holyport Conservation Area	Construction best practice to minimise disruption, e.g. protection of retained existing vegetation, including trees covered by TPOs or within conservation areas lying immediately adjacent to the Order limits.	<u>Landscape</u> Moderate adverse on landscape Slight adverse on the urban area <u>Visual amenity</u> Moderate adverse to major adverse	<u>Landscape</u> Moderate adverse on landscape Slight adverse on the urban area <u>Visual amenity</u> Moderate adverse to major adverse	No additional sensitive receptors have been identified Minor additional vegetation clearance	Although minor additional vegetation clearance in some places, the landscape proposals provide mitigation planting to ensure that screening to sensitive receptors is provided.	Protection of retained existing vegetation, including trees covered by TPOs within and immediately adjacent to the Order limits and within a conservation area.	<u>Landscape</u> Moderate adverse on landscape Slight adverse on the urban area <u>Visual amenity</u> Moderate adverse to major adverse	The conclusion of the ES assessment remains valid

Table 7 Temporary Landscape and Visual Impacts during Construction

Permanent Impacts during Operation

Scheme Link	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	
	Junction 10 to 8/9 – NCA 115 (Thames Valley) and Junction 8/9 to 7–NCA 115 (Thames Valley)									
Permanent Impacts (Operation)	Overbridges and associated earthworks, engineered embankment slopes and gantries either on top of embankments or in close proximity to residential properties	<u>Landscape Receptors:</u> None affected <u>Visual Receptors:</u> Rural residential properties at Paley Street Residential properties between Ascot Road Overbridge and Chainage 32-400, EB and WB PRoWs west of Junction 8/9 PRoWs at Monkey Island Overbridge Ockwells Park LNR Holyport Conservation Area	Woodland (EE L2.9) and new tree and shrub planting (EE L2.3) to replace the vegetation lost.	<u>Landscape</u> Slight adverse <u>Visual amenity</u> Slight adverse reducing over time to neutral for rural residential properties at Paley Street. Moderate adverse reducing overtime to slight adverse for users of PRoW in the vicinity of Stud Green Access overbridge Slight adverse reducing to neutral for users of other PRoW within the rural area.	<u>Landscape</u> Slight adverse <u>Visual amenity</u> Slight adverse reducing over time to neutral for rural residential properties at Paley Street. Moderate adverse reducing overtime to slight adverse for users of PRoW in the vicinity of Stud Green Access overbridge Slight adverse reducing to neutral for users of other PRoW within the rural area	No change to existing and no additional sensitive receptors have been identified	Although minor additional vegetation clearance in some places, the landscape proposals provide mitigation planting to ensure that screening to sensitive receptors is provided	Woodland (EE L2.9) and new tree and shrub planting (EE L2.3) to replace the vegetation lost	<u>Landscape</u> Slight adverse <u>Visual amenity</u> Slight adverse reducing over time to neutral for rural residential properties at Paley Street. Moderate adverse reducing overtime to slight adverse for users of PRoW in the vicinity of Stud Green Access overbridge Slight adverse reducing to neutral for users of other PRoW within the rural area	The conclusion of the ES assessment remains valid

Table 8 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	Significance of Residual Effect		Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 10 to 8/9 – NCA 115 (Thames Valley) and Junction 8/9 to 7–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> Neutral <u>Visual amenity</u> Neutral	None required	<u>Landscape</u> Neutral <u>Visual amenity</u> Neutral	The conclusion of the ES assessment remains valid

Table 9 Cumulative Landscape and Visual Impacts

Summary

Regarding temporary impacts during construction, it is concluded that there are:

Rural residential properties at Paley Street: Minor additional vegetation clearance on the westbound close to the footbridge. However, M4 lies in a cutting and therefore properties will not be affected by clearance. Slight adverse impact due to additional vegetation clearance.

Residential properties between Ascot Road Overbridge and Chainage 32-400, eastbound and westbound: No change.

Public Rights of Ways west of Junction 8/9: Minor additional vegetation clearance on the eastbound close to the footpaths. Slight adverse impact due to additional vegetation clearance.

Public Rights of Ways west of Junction 8/9 at Monkey Island Overbridge: No change.

Ockwells Park LNR: No change.

Holyport Conservation Area: No change.

Regarding permanent impacts during operation, it is concluded that there are:

Slight adverse impact at rural residential properties at Paley Street and Public Rights of Way west of Junction 8/9, due to minor additional clearance, with mitigation planting in place, screening to sensitive receptors is provided.

Gantries:

For a detailed gantry specific change assessment, refer to **Appendix A**.

G6-19: slight adverse as now closer to residential properties.

All other gantries: no change to original assessment.

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 the sensitive receptors identified 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 sensitive receptors identified 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.

9.4.4 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.

9.5 Water

9.5.1 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 change 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.

9.5.2 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.
- Changes to groundwater due to a change in the footprint of works within a Source Protection Zone (SPZ) or overlying a Principal Aquifer.

9.5.3 Change Assessment Findings

Review of Baseline Conditions

The future baseline described in the 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 waterbody local to junction 8/9 (The Cut) there has been a degradation of chemical water quality status. The WFD groundwater body (the Twyford tertiaries) is at the same status as reported in the ES.

With regards to flood risk, junction 8/9 is bordered, to the west and east, by areas of Environment Agency Flood Zone 3, land defined as having an annual probability of flooding from rivers and the sea of 1% or greater. This floodplain is associated with a watercourse known as The Cut, a tributary of the River Thames. Comparison of the 2015 and current Environment Agency flood map shows there have been no changes to the spatial extent of Flood Zone 3, and Flood Zone 2 is less extensive on the present-day flood map.

Changes in the baseline qualities of water environment receptors local to junction 8/9 are therefore relatively 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 Cut watercourse is crossed at two locations by the on/off slips of junction 8/9 and the assessment presented in the ES was based on there being no works to these existing crossings, and no works taking place within its floodplain.

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

² Environment Agency - Catchment Data Explorer

The 2021 NMC Design results in a reduced width of pavement widening works and generally a smaller earthworks footprint within the floodplain. The 2021 NMC Design has been subject to detailed floodplain impact assessments, reported on to discharge DCO Requirement 23. The floodplain impact assessment has demonstrated that the 2021 NMC Design would cause negligible changes to baseline 1 in 100 year plus climate change flood levels. These changes fall comfortably within a tolerance (+5mm) that has been agreed as acceptable with the Environment Agency. The 2021 NMC Design is therefore concluded to have a neutral effect on fluvial flood risk, with a minor overall benefit to the land drainage regime due to the reduction in impermeable land cover.

Changes to traffic flows have been assessed. The anticipated changes to AADT traffic flows and the number of HDV vehicles are all reductions, albeit the magnitude of the reductions is relatively small (see Section 9.1). Consequently, it is considered that there would be a minor reduction in the risk of pollution of receiving watercourses due to accidental spillages and from the discharge of routine runoff.

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. Subsequently, as part of detailed design, DMRB HD 45/09 assessments incorporating HAWRAT (risk assessment on surface watercourses), groundwater risk assessments and accidental spillage risk assessments were carried out at all outfalls.

At junction 8/9, the accidental spillage risk assessment confirms that the risk level is acceptable, and no further spillage containment or mitigation measures are necessary at existing outfalls to prevent baseline water quality deterioration.

The groundwater pollution risk assessments have concluded that the ditches over the Bray Gravels Source Protection Zone at the Thames (at Bray) are potentially at risk of groundwater contamination. This is the same outcome as for the 2015 DCO Design. Mitigation for these risks will be provided by lining of the ditches. The land at junction 8/9 is situated within a groundwater SPZ zone 3 (outer). The underlying bedrock geology supports a Secondary A aquifer, with this category of aquifer also being supported by localised drift deposits. The 2021 NMC Design would reduce overall the scale and footprint of construction works, for example reducing the width of pavement widening. The potential for effects on groundwater flows, levels and groundwater quality would be marginally reduced, with the 2021 NMC Design overall representing a minor beneficial change for groundwater receptors.

The assessments for surface waters have demonstrated that long-term, statutory water quality standards, defined by the Environmental Quality Standards for dissolved copper and zinc, are met. Short-term impacts defined by runoff specific thresholds for dissolved copper and zinc, as well as the degree of sedimentation at outfalls, were both at an acceptable level and were no worse than the baseline.

The DMRB HD 45/09 assessments therefore confirm that the impact of the 2021 NMC Design on water quality would be neutral.

9.5.4 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 the land drainage regime and groundwater, and therefore the assessment and conclusions presented in the ES remain valid.

10 Conclusion

Through traffic modelling, operational, safety and environmental change assessments, and considering customer disruption, it has been found that the most suitable solution for junction 8/9 as part of the scheme is to implement a No TJR arrangement. The operational appraisal has found that peak hour traffic flows do not justify 4 lanes, and that the projected traffic flows can be accommodated into the existing 3 lanes.

As a result of adopting a no TJR arrangement at junction 8/9, the location and types of gantries (and as appropriate CCTV and POPs) associated with the junction have required changing.

The 2021 NMC Design (inclusive of the gantry changes) 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 to Examination. Therefore, the assessment and conclusions presented in the ES remain valid.

Appendix A. Gantry visual impact assessment

Gantry Ref.	Scheme Chainage	Height (m above Finished Road Level)	Status	Design Year (2037) Effects on Views	Design Year (2037) Effects on landscape character	Comment
G6-11	31556	9.4	New	Slight adverse	Contribute to Slight adverse	Visible from adjacent residential properties and public rights of way on both sides
G6-11a	N/A	n/a	n/a	n/a	n/a	n/a
G6-13	31807	9.2	New	Neutral	Neutral	Set in the context of adjacent retained vegetation, other vegetation outside the Order limits and remote from high sensitivity receptors
G6-14	32159	9.2	New	Neutral	Neutral	Set in the context of adjacent retained vegetation, replacement planting, other vegetation outside the Order limits and remote from high sensitivity receptors
G6-16	32441	9.4	New	Slight adverse	Neutral	Potentially visible from adjacent residential properties (eastbound)
G6-16a	N/A	n/a	n/a	n/a	n/a	n/a
G6-17	32963	9.2	New	Slight adverse	Neutral	Visible from adjacent residential properties (eastbound)
G6-18	32866	12.8	New	Neutral	Neutral	Set in the context of retained vegetation and adjacent trees outside the Order limits
G6-19	33194	11.2	New	Neutral	Neutral	Set in the context of adjacent trees outside the Order limits and remote from high sensitivity receptors
G7-02	35148	15.1	New	Slight adverse	Neutral	Visible from public right of way on both sides (see Appendix 4.3 of the ES; Photomontage - Stud Green A4-3.2)
G7-04	35103	n/a	n/a	neutral	neutral	Move 3m east
G7-05	35786	10.0	New	Neutral	Neutral	Set in shallow cutting with associated retained vegetation, replacement planting and remote from high sensitivity receptors
G7-05a	N/A	n/a	n/a	n/a	n/a	n/a
G7-10	36663	10.0	New	Neutral	Neutral	Set in shallow cutting with associated replacement planting, vegetation outside the Order limits and remote from high sensitivity receptors
G7-10a	N/A	n/a	n/a	n/a	n/a	n/a

Table 10 2015 Gantry Visual Assessment

Gantry Ref.	Scheme Chainage	Height (m above Finished Road Level)	Status	Design Year (2037) Effects on Views	Design Year (2037) Effects on landscape character	Comment
G6-11	Removed since 2017	n/a	n/a	n/a	n/a	Removed (replaced by G6-11a)
G6-11a	31562	13.5	New	Slight adverse	Contribute to Slight adverse	Replacing G6-11 9m away, changing from ADS cantilever to super cantilever, with extra MS4 to be added
G6-13	32156	9.2	New	Neutral	Neutral	G6-14 removed from scheme, and G6-13 moved to ch 32156 (moving 351m). Changed from MS4 to MS3.
G6-14	Removed since 2017	n/a	n/a	n/a	n/a	Removed from scheme, being replaced in same location by G6-13
G6-16	Removed since 2017	n/a	n/a	n/a	n/a	Removed from scheme and replaced by G6-16a. 1/2 mile ADS - change to superspan cantilever – MS4 from G6-14 to be added.
G6-16a	32353	13.5	New	Slight adverse	Neutral	Replacing G6-16 93m away, changing from ADS cantilever to super cantilever, with extra MS4 to be added.
G6-17	Removed since 2017	n/a	n/a	n/a	n/a	Removed from scheme since 2017
G6-18	Removed since 2017	n/a	n/a	n/a	n/a	Removed from scheme since 2017
G6-19	33062	11.2	New	Slight adverse	Neutral	Add lane signals and MS4 on EB and MS4 on WB (to replace MS4 from G6-17). Type to change to superportal and moved to ch 33062 (moving 131m), closer to residential properties
G7-02	35156	15.1	New	Slight adverse	Neutral	Moved 10m since 2017. Signs to become higher.
G7-04	35103	n/a	n/a	neutral	neutral	Move 3m east, no change to visual setting
G7-05	Removed since 2017	n/a	n/a	n/a	n/a	Removed from scheme
G7-05a	35776	13.5	New	Neutral	Neutral	Replacing G7-05 8m away, changing from ADS cantilever to super cantilever.
G7-10	Removed since 2017	n/a	n/a	n/a	n/a	Removed from scheme
G7-10a	36644	13.5	New	Neutral	Neutral	Replacing G7-10 13m away, changing from ADS cantilever to super cantilever.

Table 11 2022 Gantry Visual Change Assessment