

Smart Motorways Programme

M4 Junctions 3 to 12 Smart Motorway

Non-Material Change Junction 11 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 D 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 11 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 11 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 11 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

The appraisal of congestion at junction 11 is based on data described in Section 6.1. It found that there is currently regular congestion in the AM peak originating at the circulatory carriageway at junction 11 resulting in queuing traffic in lane one of the mainline upstream. The interaction between queuing traffic in lane 1 on the main carriageway and other traffic in lane 2 & 3 then causes congestion across all lanes on the approach to the junction. Since no improvements to the junction 11 slip road, roundabout or nearby local road network are (and have never been) proposed as part of the scheme, this mainline queuing will still be present at scheme opening and may be worse due to the potential for increased upstream mainline flow arriving at the junction. Therefore, a lane drop layout at the diverge is better suited to this junction than TJR, as it could reduce risks associated with queuing traffic and lane changes, as drivers continuing on the M4 will have been advised to move out of lane one, therefore reducing the likelihood of collisions due to a diverge queue extending onto the mainline.

6 Operational Appraisal of Junction 11

The aim of the appraisal was to determine the suitability of either a TJR or No TJR layout for the junction at both the scheme opening year (2022) and design year (2037). Motorgraph plots, CCTV and observed congestion have been used to determine how junction 11 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 used to determine the most appropriate operational solution for junction 11 (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 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 **Error! Reference source not found..**

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 11

6.2 Operation appraisal eastbound

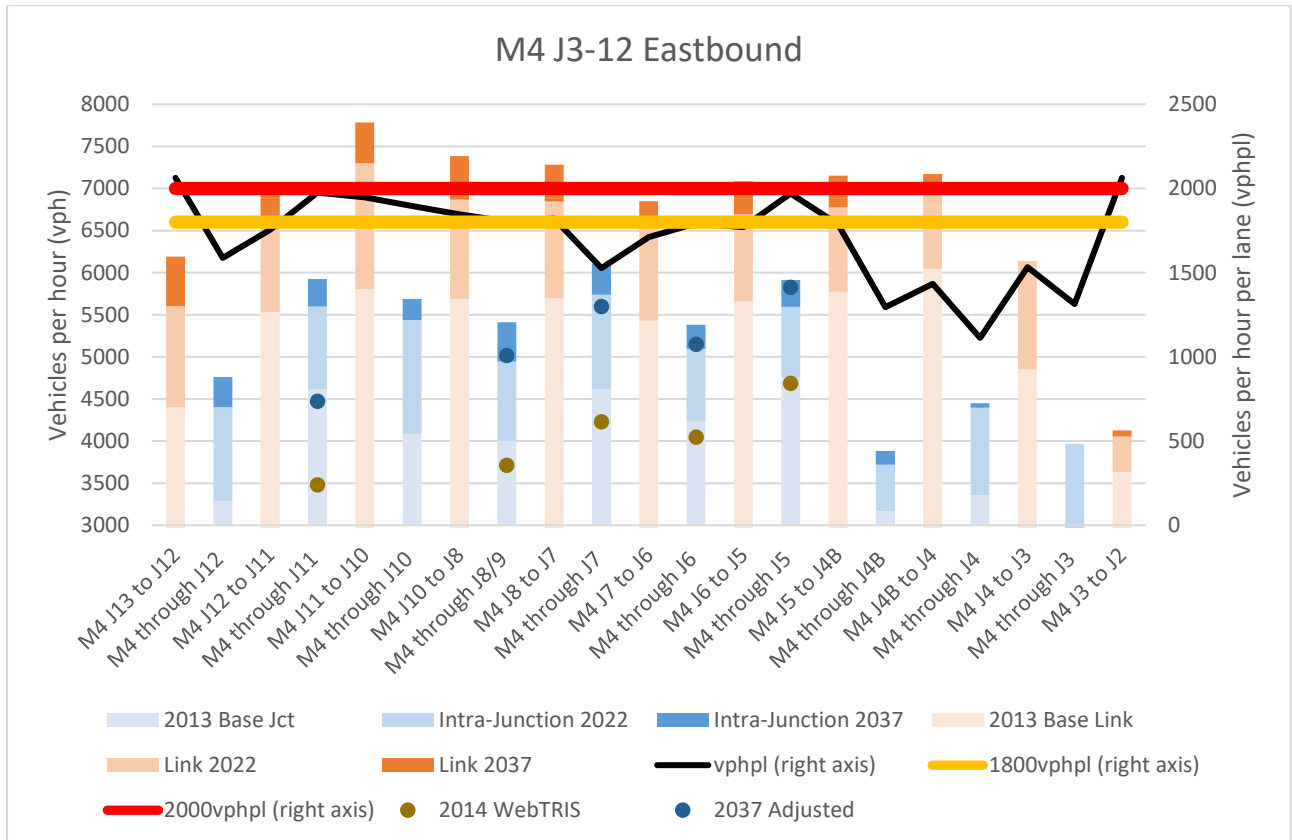


Figure 1 shows traffic data for the early AM peak from the validated traffic model (morning peak time period from 07:00 to 08:00), which consistently has the highest flows for the eastbound carriageway in this section of the scheme.

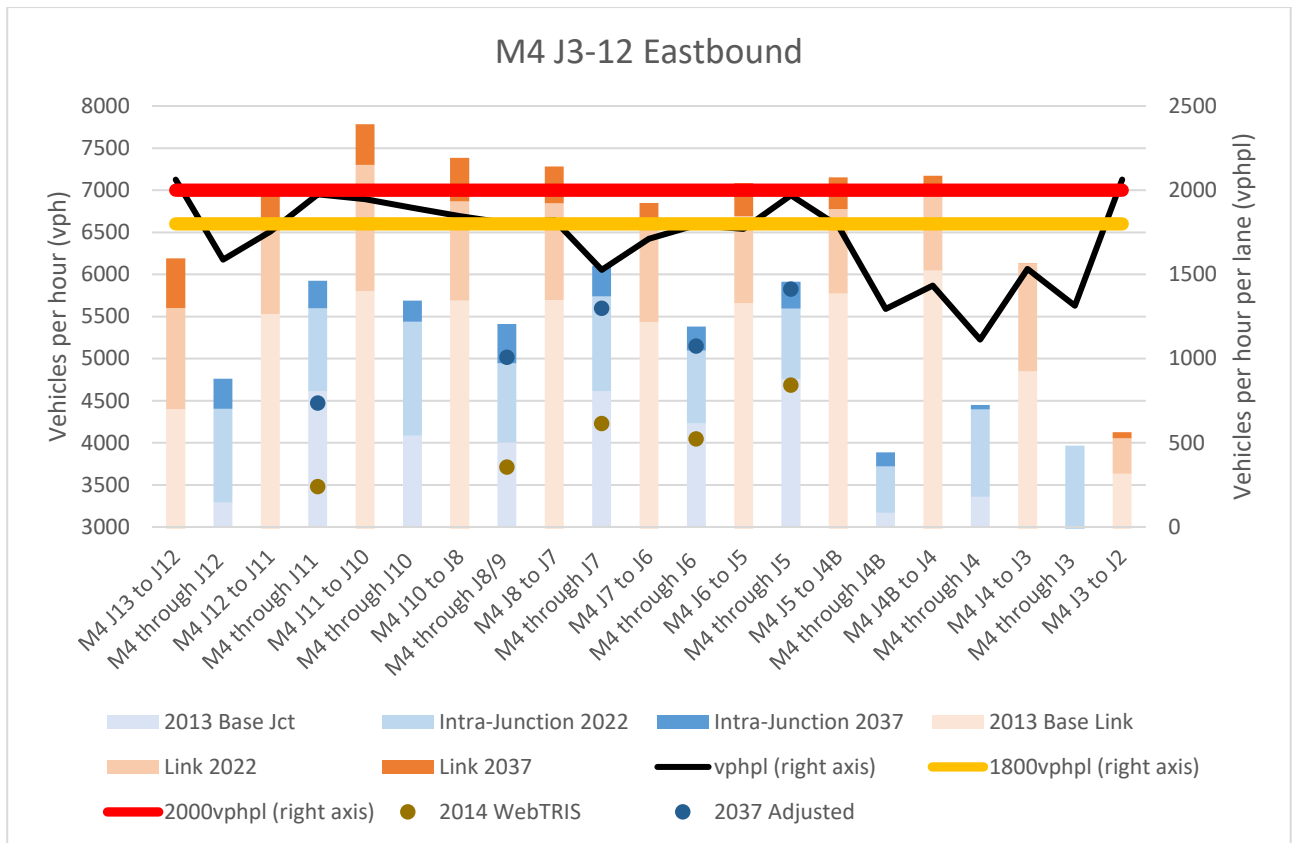


Figure 1 Junction 11 Eastbound AM peak flows

The traffic model data indicates intra junction flow without TJR (three lanes) will be 5600vph (i.e. less than 2000vph per lane) compared to 5835vph with TJR in the opening year, and 5925vph (i.e. less than 2000vph per lane) compared to 6100vph with TJR in the design year. The observed intra junction flows from WebTRIS loop data from 2013 & 2014 are 1130vph (24%) lower than the base year traffic model. Similarly, the 2013 & 2014 observed merge and diverge flows are approximately 800vph higher than the base year in the traffic model. Given this significant disparity, WebTRIS data from 2014 to 2017 has been checked to determine that this is not a temporary irregularity, and all have been found to be consistent with the 2014 data. The combined slip road and intra junction flows are also consistent with upstream and downstream mainline flows giving good confidence to this data. A simple adjustment of 24% reduction to the traffic model forecast flows would result in opening year flow of 4256vph (1419 vph per lane) and design year flow of 4503vph (1501vph per lane), both of which are well within the capacity of a No TJR layout.

As a congestion appraisal has shown, there is regular congestion in the AM peak originating at the eastbound diverge resulting in queueing traffic in lane one of the mainline upstream. Since no improvements to the junction 11 slip road, roundabout or nearby local road network are and have never been proposed as part of the scheme, this mainline queueing will still be present at scheme opening and may be worse due to the potential for increased upstream mainline flow arriving at the junction. Therefore, a lane drop layout (implemented with the proposed No TJR layout) at the diverge is better suited to this junction than TJR, as it could reduce risks associated with queueing traffic and lane changes, as drivers continuing on the M4 will have been advised to move out of lane one, therefore reducing the likelihood of collisions due to a diverge queue extending onto the mainline. A safety risk assessment comparing TJR and No TJR was undertaken in November 2019 which was endorsed by the National Safety Control Review Group (NSCRG). The appraisal confirmed that No TJR has the potential to reduce exposure of road users to risks on the approach to junction 11.

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

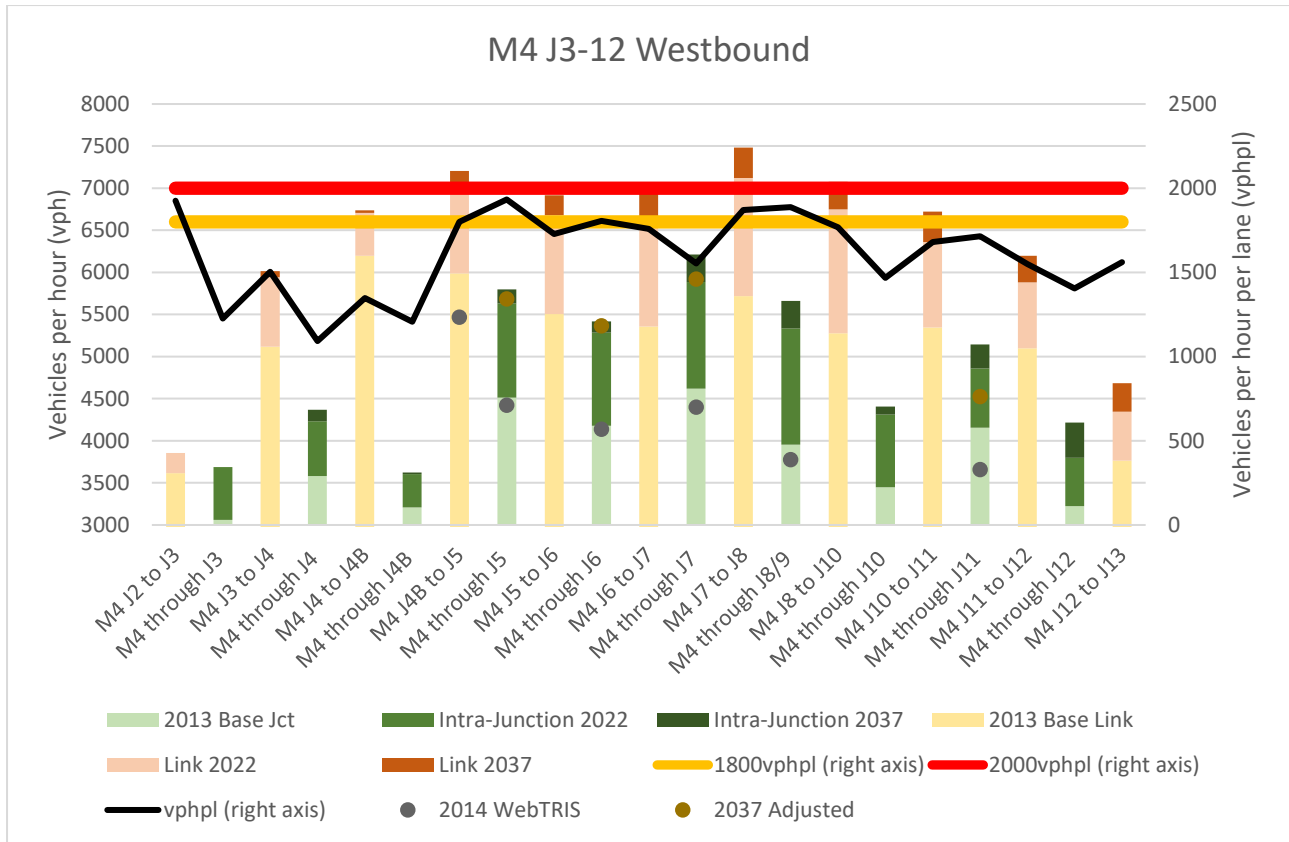


Figure 2 shows traffic data for the PM peak from the validated traffic model (afternoon peak travel time period from 17:00 to 18:00), which consistently has the highest flows for the westbound carriageway in this section of the scheme.

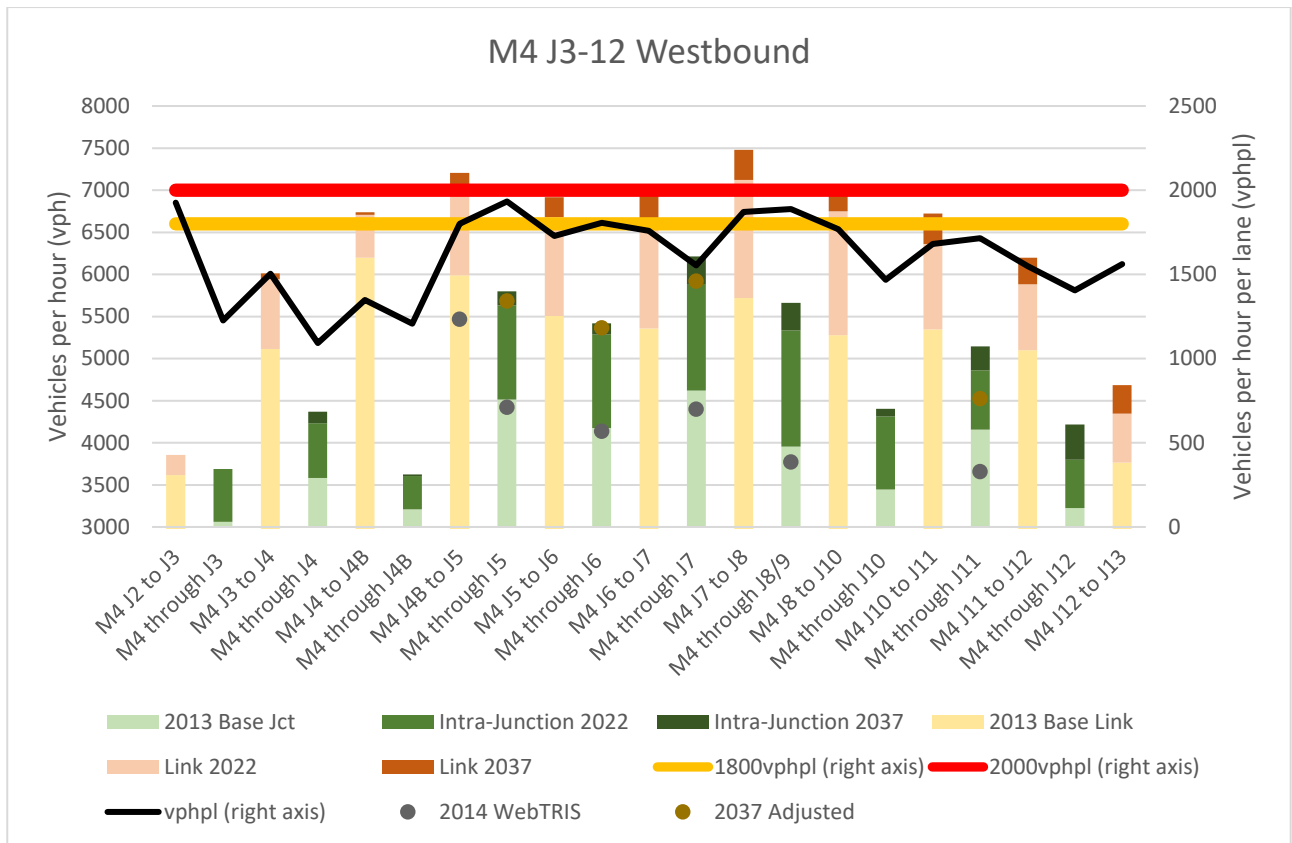


Figure 2 Westbound PM peak flows

The traffic model data indicates intra junction flow without TJR (three lanes) will be 4860vph (i.e. less than 1800 vph per lane) compared to 4910vph with TJR in the opening year, and 5145vph (i.e. less than 2000 vph per lane) compared to 5220vph with TJR in the design year.

There is regular congestion in the AM peak originating at the westbound diverge resulting in queueing traffic in lane one of the mainline upstream. Since no improvements to the junction 11 slip road, roundabout or nearby local road network are and have never been proposed as part of the scheme, this mainline queueing will still be present at scheme opening and may be worse due to the potential for increased upstream mainline flow arriving at the junction. Therefore, a lane drop layout (implemented with the proposed No TJR layout) at the diverge is better suited to this junction than TJR, as it could reduce risks associated with queueing traffic and lane changes, as drivers continuing on the M4 will have been advised to move out of lane one.

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

7 2021 NMC Design

The DCO to construct the scheme was granted on 2nd September 2016 on the basis that junction 11 would be widened to accommodate TJR. The decision to implement No TJR at junction 11, 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 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 2) layout as per DMRB TD22/06 – a lane drop with parallel diverge. Currently, both the westbound and eastbound diverges are Type B (Option 1). The westbound merge will be a Type E lane gain and the eastbound merge will be a Type F (Option 1) lane gain with ghost island. Currently, both the westbound and eastbound merges are Type A (Option 2). All proposed layouts at junction 11 fit within the existing pavement width.

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

The gantry design concept for No TJR is to provide both ahead and exit Advance Direction Signs (ADS) at all diverges. These are essential at two lane ghost island diverges (Type D) to adequately inform road users of the road layout and to optimise lane usage. Therefore, the provision of ahead and exit ADS will require some changes of gantry type from short span cantilever to long span cantilever or super-span portal. Furthermore, the locations of gantries are primarily set by the datum point of the merge/diverge lanes at the junction, which has moved as a result of no longer implementing TJR. As a result, the gantry arrangement associated with junction 11 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 11, whereas Figure 4 shows the new proposed layout of junction 11 (with No TJR).

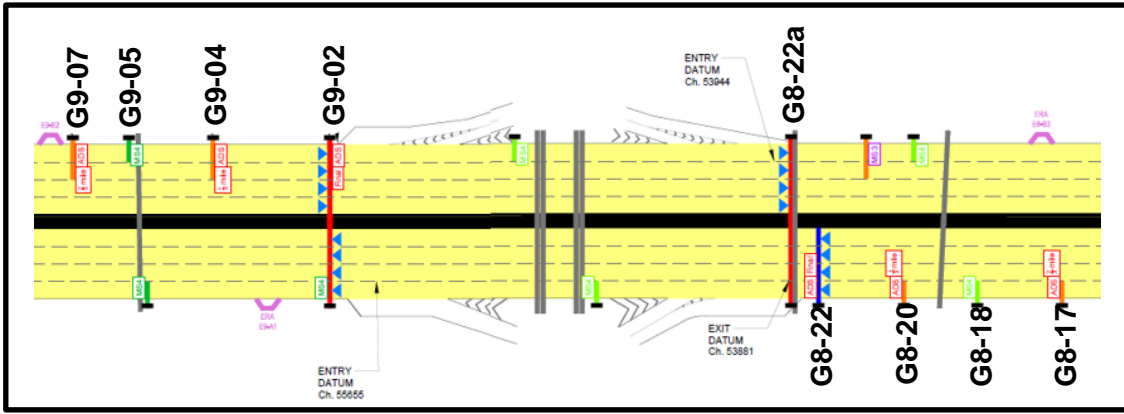


Figure 3 Schematic showing layout of junction 11 with TJR

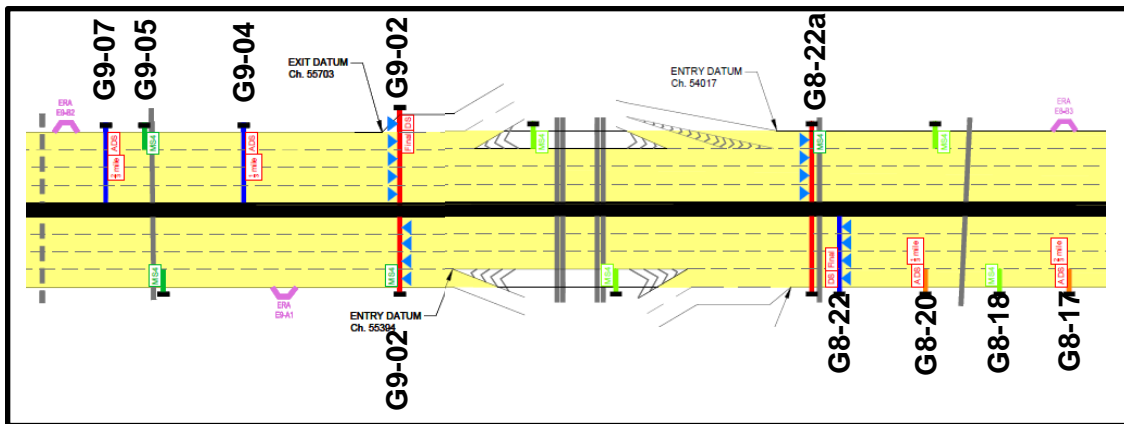


Figure 4 Schematic showing layout with junction 11 without TJR

The details eastbound and westbound gantries are provided in Table 2 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
G9-07	Proposed	56952 ADS Cantilever	56883 ADS Cantilever	69m	Yes	Gantry moved 69m west due to removal of TJR
G9-04	Proposed	56355 ADS Cantilever	56293 ADS Cantilever	62m	Yes	Gantry moved 62m east due to removal of TJR
G9-02	Proposed	55855 Super-Span Portal	55628 Super-Span Portal	227m	Yes	Gantry moved 227m east due to removal of TJR
G8-22a	Proposed	53872 Super-Span Portal	53872 Super-Span Portal	Extra MS4	No	MS4 from G8-22b is moved onto G8-22a
G8-22b	Proposed	53558 MS3 Cantilever	Removed	Removed	No	Removed due to visibility constraints. Extra MS4 added to G8-22a.

Table 2 Location and changes to eastbound junction 11 gantries

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
G8-17	Proposed	52712 ADS Cantilever	52778 ADS Cantilever	66m	Yes	Gantry moved 66m west due to removal of TJR,
G9-02	Proposed	55855 Super-Span Portal	55628 Super-Span Portal	227m	Yes	Gantry moved 227m west due to removal of TJR

Table 3 Location and changes to westbound junction 11 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

The eastbound merge maintains the 2015 DCO proposed slotted linear drainage channel and the westbound diverge maintains the 2015 DCO proposal to retain the existing drainage, with the short section of proposed kerb drainage now replaced with retention of the existing drainage.

Further east of the slip roads, the eastbound verge maintains the 2015 DCO proposals of filter drains and slotted linear drainage channel. There are some sections of new filter drains where it was not feasible to retain the existing filter drain as indicated previously in the 2015 DCO.

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. There is a small section of the eastbound verge where the slotted linear drainage channel proposed in the 2015 DCO is now proposed to be a filter drain.

West of Junction

The eastbound diverge maintains the 2015 DCO proposal to retain the existing drainage with the short section of proposed kerb drainage now replaced with retention of the existing drainage. The minimal changes along the westbound merge due to No TJR has enabled more of the existing drainage to be retained rather than replacing it with slotted linear drainage channel that was proposed in the 2015 DCO.

Further west of the slip roads, the eastbound and westbound verges maintain the 2015 DCO proposals of slotted linear drainage channel.

Central Reserve

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

Summary

In summary there are no significant changes to the 2015 DCO drainage proposals, with the greatest change taking place on the westbound merge, where the existing drainage has been retained instead of providing slotted linear drainage channel.

7.5 Earthworks changes

7.5.1 2015 DCO Design

The 2015 DCO Design for junction 11 indicated earthwork widening was required over the extents, and via the geotechnical widening solutions, summarised below.

East of Junction

- Eastbound Ch52400-54570 – No widening east of Ch54100 (approx.), with conventional (i.e. unreinforced) embankments to the west of that chainage
- Westbound Ch52400-54570 – No widening east of Ch54400 (approx.), with conventional embankments to the west of that chainage

Intra-Junction

- Eastbound – No widening
- Westbound – No widening

West of Junction

- Eastbound Ch55170-57800 – Minor conventional embankments Ch55170-55305 (approx.), no widening elsewhere
- Westbound Ch55170-57800 – No widening.

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 the existence of narrower verges on the approaches to and through the junction than had previously been anticipated. This key finding resulted in an expansion of the areas requiring verge widening, and the additional requirement for more vertical retaining walls in order to keep the earthworks footprint within the available land take. The outline details of the 2018 DCO Discharged Design are summarised below.

East of Junction

- Eastbound Ch52400-54570 – Localised, conventional cuttings and embankments (at verge build-outs), with continuous earthworks east of Ch53100 and west of Ch54200
- Westbound Ch52400-54570 – Localised, conventional cuttings and embankments (at verge build-outs), with continuous earthworks east of Ch53100 and west of Ch54200

Intra-Junction

- Eastbound – Conventional cuttings, mainly at build-outs
- Westbound – Conventional cuttings; vertical steel sheet piled wall at signage gantry G8-23, and a sub-vertical concrete slab-on-end locally between the mainline and westbound diverge.

West of Junction

- Eastbound Ch55170-57800 - Conventional embankments (locally steepened to 1v:1.5h at the east-end); vertical steel sheet piled wall between Ch55350 and 55690
- Westbound Ch55170-57800 - Conventional embankments; vertical steel sheet piled wall at Emergency Area E9-A1; and vertical L-shaped concrete retaining walls at signage gantry G9-06 and above culvert at Ch56550.

7.5.3 2021 NMC Design

The 2021 NMC Design is broadly similar to the 2018 DCO Discharged Design, albeit it with a local optimisation away from steel sheet piles to sub-vertical concrete, slab-on-end solutions wherever possible. Additional verge build-outs for communications infrastructure have required isolated sections of vertical L-shaped concrete or steel sheet piled walls. Outline details of the 2021 NMC Design are summarised below.

East of Junction

- Eastbound Ch52400-54570 – Largely continuous, conventional embankments and cuttings; replacement of vertical L-shaped reinforced concrete walls behind build-outs at Ch53550-53600 and Ch53630 with earthworks; vertical steel sheet piled wall behind build-out at Ch53180.
- Westbound Ch52400-54570 – Localised, conventional cuttings and embankments (at verge build-outs); vertical L-shaped reinforced concrete wall behind build-out at Ch52910 and replacement of L-wall with embankment at G8-20 (Ch53630)

Intra-Junction

- Eastbound – Conventional very minor cuttings, with sub-vertical concrete slab-on-end at build-outs but also between; vertical steel sheet piled walls behind build-outs at Ch54615, Ch54750, Ch54815 and Ch54970
- Westbound – Conventional very minor cuttings; vertical L-shaped reinforced concrete wall at Ch54910

West of Junction

- Eastbound Ch55170-57800 - Conventional embankments (very minor to east of Ch55950, but full-height west of this chainage); vertical steel sheet piled wall Ch55350-55690 replaced with minor embankments; vertical steel sheet piled wall behind build-out at signage gantry G9-04 (Ch56280)
- Westbound Ch55170-57800 – No widening east of Ch55850; conventional embankments (very minor to east of Ch56000, but full-height west of this chainage); vertical steel sheet piled wall at Emergency Area E9-A1 (Ch56180-56275) and replacement of vertical L-shaped concrete retaining walls at signage gantry G9-06 and above culvert at Ch56550 with embankments.

7.5.4 Change Summary

In summary, the key changes between the 2015 DCO Design and the 2021 NMC Design are the significant reduction of the areas of verge earthworks requiring widening, and the additional requirement for more vertical retaining walls in order to keep the earthworks footprint 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 indicated narrower verges on the approaches to and through the junction than had previously been anticipated. Additionally, full-height re-facing of the existing, historically instability-prone embankments located west of Ch56000 has been specified, regardless of whether widening of the overlying verge is required, following a risk assessment exercise instructed by National Highways, which was triggered by on-site reports of ostensibly instability-related cracking to the hard shoulder/verge through this section of the scheme.

8 Safety

8.1 Driver and Non-Motorised user safety

The findings of the operational and congestion appraisal above, and safety risk assessments have found that the provision of No TJR at junction 11 would provide a safe environment for drivers due to a lane drop scenario that would provide additional stacking capacity on the approach to the junction. 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 to junction 11 in either the 2015 DCO design or the 2021 NMC design, so NMU safety is not affected by the proposed change. 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 11.

Gantry changes have been assessed to ensure that all signs and signals located on these gantries can be seen clearly by drivers in compliance with the smart motorway design standards implemented by 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 at 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 the following new committed developments, meeting the selection criteria outlined in Chapter 16 of the ES, is present within 1km of the 2021 NMC Design. ~~These~~ This new developments ~~is-are~~ considered in the sections below.

Proposal	LPA / Planning Application	Address	Distance from Junction	Other information	Approach taken in Assessments
Junction 11 https://wokingham.maps.arcgis.com/apps/MapJournal/index.html?appid=209ba2e06e0744cab4e954eabe97d505#					
Reading Gateway	151944	Imperial Way, Reading RG2 0DA, Bewley Homes	Approximately 700m north of Junction 11	Number of homes – Assumed 151 Homes Under construction	<p><u>LVIA,</u></p> <p>Development treated as new baseline receptor</p> <p>As discussed in sections below there is no material change to ES assessment arising from the proposed changes. It is not considered that this would change if this new development was treated cumulatively.</p> <p><u>Noise & Air Quality</u></p> <p>Development treated as potential new baseline receptor.</p> <p>Traffic data underpinning assessment accounts for Temprow growth, and even if this was considered additional to that growth it would have marginal impacts.</p> <p><u>Biodiversity</u></p> <p>Development treated cumulatively</p>

Table 4 New committed development

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.

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. 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.

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. The new committed development identified in Table 4 will be unaffected by construction dust emissions as they are all over 200m from the works.

Operation

The closest receptors to the 2021 NMC Design are located on the north east and south west sides of the junction. The closest receptors to the north east of the junction are located on Harness Close (receptor X56). The closest receptors to the south east of the junction are located on Hartley Court Road (receptors X57 and N1078). As reported in the ES, annual mean concentrations of nitrogen dioxide (NO₂) of 17.5-24.1 µg/m³ were predicted at these receptors with the 2015 DCO Design in operation (Do Something), with increases of 0.3-0.8µg/m³ compared to without the 2015 DCO Design (Do Minimum). This is well below the annual mean air quality objective of 40 µg/m³.

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 5.

Traffic Data – through junction	Change due to 2015 DCO Design	Change with 2021 NMC Design	Differences between Datasets
AADT (veh/day)	+7,623	+6,012	-1,611
HDV (veh/day)	+213	+129	-84
Average Daily Speed (kph)	+4	-2	-6

Table 5 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.

The comparison of the 2015 DCO Design and the 2021 NMC Design shows the removal of a running lane through junction 11. 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.

The additional committed developments identified in Table 4 above are more than 200m from the affected road network, therefore no significant air quality effects are anticipated at these locations.

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 the new committed developments within the junction 11 study area (which will have taken into account the prevailing noise levels at planning stage in any event) 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 11 and the surrounding area. There is a substantial residential area to the north/north east of the junction (distance > 250m from centre of the junction)). There are smaller residential areas to the south (distance > 300m). The closest residential area is a small line of properties on Hartley Court Road, directly to the west of the junction at a distance of > 200m from the centre of the junction.



Figure 5 Junction 11 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.

Construction of the new segregated lane to the slip on the east side of the junction will be relatively short term and should not result in significantly higher noise and vibration levels to surrounding sensitive receptors than those which would result from TJR construction.

Similarly, removal of the segregated lanes to the slips on the east and west side of the junction will be relatively short term and should not result in significantly higher noise and vibration levels to surrounding sensitive receptors than those which would result from TJR construction.

With the implementation of good site practices, these works will have no additional significant effect on the nearest sensitive receptors when compared to 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).

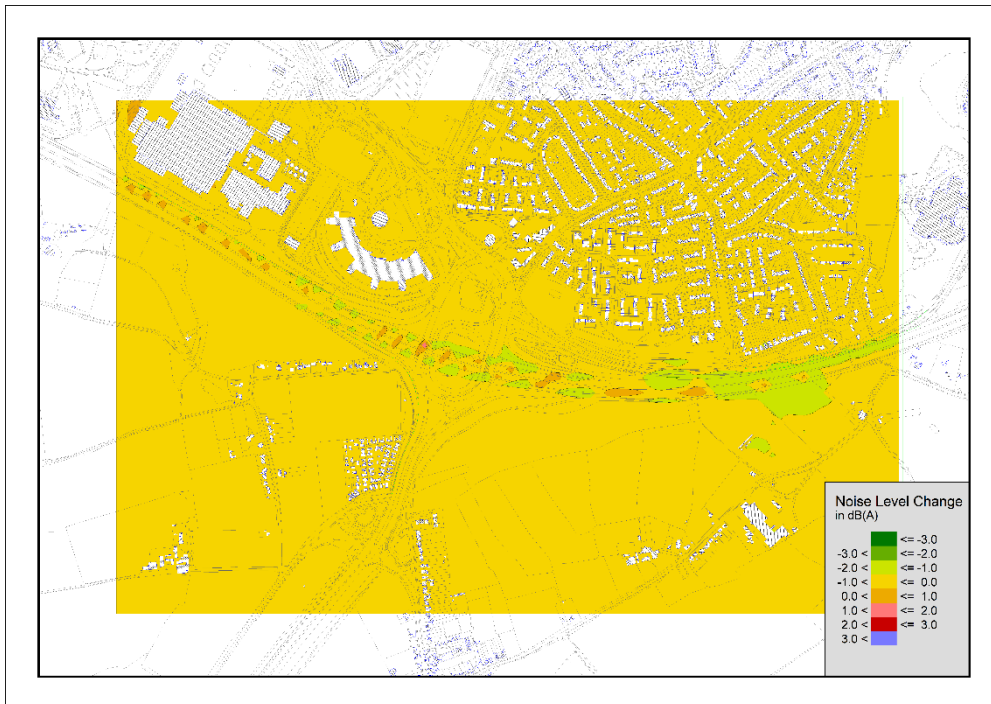


Figure 6 Noise level changes (DS22 No TJR) minus (DS22 With TJR)

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 52+400 and 56+900.

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-301229 to 514451-MUH-ML-ZZ-DR-SC-301231; Sheets 5 to 7; revision 6F 04/02/2016)
- 2021 NMC Design Vegetation Clearance Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5319 to ELS-SZ_ZZZZZZZZ_Z-DR-LD-5320; Sheets 4 to 6; 2022 revision P01)
- 2021 NMC Design Environmental Masterplan Drawings (ELS-SZ_ZZZZZZZZ_Z-DR-LD-5208 to ELS-SZ_ZZZZZZZZ_Z-DR-LD-5212; Sheets 8 to 12; 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 habitat that would be lost include small areas of broad-leaved plantation woodland, dense scrub, scattered scrub, scattered broad-leaved trees, tall ruderal vegetation, semi-improved neutral grassland, poor semi-improved grassland, and ditches. These areas are 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 woodland, trees, scrub, and shrubs, 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 an area of ancient woodland), invasive species, amphibians, reptiles, birds, bats, water vole (*Arvicola amphibius*), otter (*Lutra lutra*), and badger (*Meles meles*). Table 6 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 species, birds, bats, water vole, otter, and badger when assessed against the DCO baseline ecological information is **neutral**, which represents no change from the assessment of the 2015 DCO Design presented in the ES (**neutral**).

The significance of residual effects of the 2021 NMC Design on amphibians and reptiles 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 6 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 habitats and plants, invasive species, amphibians, reptiles, bats, and badger has been recorded within the study area. Table 6 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 species, birds, bats, water vole, otter, and badger 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 and reptiles 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**).

In respect of committed developments, whilst there is a lack of available detailed ecological information, references are made to protection of potential ecological features through planning conditions and mitigation. Therefore, it is considered likely there would be no residual significant cumulative effects as a result of these two developments.

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

The mitigation as listed in Table 6 (below), and described within the ES, remains appropriate and sufficient. Since publication of the ES, a great crested newt (*Triturus cristatus*) licence has been obtained for the scheme, and mitigation measures have been implemented to avoid any harm to great crested newts. No additional mitigation is required. These mitigation measures are all included within the current version of the CEMP (as discharged under Requirement 8 of the DCO).

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	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 The Grove Local Wildlife Site (LWS), Shinfield Park and Nore's Hill LWS, Pearsman's Copse, Burghfield Gravel Pits LWS and Great Lea Pond LWS.)	None	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 The Grove LWS, Shinfield Park and Nore's Hill LWS, Pearsman's Copse, Burghfield Gravel Pits LWS and Great Lea Pond LWS.)	
Habitats and plants	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 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.)	Veteran Oak (<i>Quercus</i> sp.) tree AVT 001 recorded at 54+220 WB just outside scheme boundary	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 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. In the CEMP, minimising works areas includes provision for retaining and protecting all large trees wherever possible.)	

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 - ancient woodland	National	None	None required	Neutral No residual effects	Neutral No residual effects (No change to effects on ancient woodland.)	None	National	None	None required	Neutral No residual effects (No change to effects on ancient woodland.)		

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		
Invasive 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.)	Canadian Waterweed (<i>Eloдея canadensis</i>) recorded at 56+500 EB Giant Hogweed (<i>Heracleum mantegazzianum</i>) recorded at 56+530 EB and 56+325 EB Giant Hogweed at 56+680 EB, 56+550 central reservation, 56+275 EB, 56+250 WB, and 56+225 EB no longer present Indian (Himalayan) Balsam (<i>Impatiens glandulifera</i>) recorded at 56+650 EB & WB Indian (Himalayan) Balsam at 56+450 EB no longer present Japanese Knotweed (<i>Fallopia japonica</i>) at 53+450 EB no longer present Japanese Rose (<i>Rugosa rugosa</i>) recorded at 54+100 EB Signal Crayfish (<i>Pacifastacus leniusculus</i>) recorded at 56+550 WB	N/A	Spread	Species-specific control measures	Neutral No residual effects (Species-specific control measures remain sufficient to control spread of invasive species.)		

Amphibians	Local	Habitat loss	Pre-construction survey Phased vegetation clearance Seasonal avoidance	Slight adverse Minor permanent loss of foraging 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 112 now with positive eDNA result for great crested newt (previously good habitat suitability index assessment result) located approximately 200m north of the scheme at 55+900 Pond 111 now with positive eDNA result for great crested newt (previously not surveyed) located approximately 175m south of the scheme at 55+875 Pond New AC with assumed great crested newt presence recorded approximately 300m south of the scheme at 55+250 Medium great crested newt mitigation risk zones associated with ponds 111 and 112 present between 55+750 - 56+100 EB and 55+350 - 56+100 WB Low great crested newt mitigation risk zones associated with ponds 111 and 112 present between 56+700 - 56+950 WB, 56+125 - 56+400 WB, 56+100 - 56+350 EB, 55+375 - 55+725 EB, and 55+000 - 55+350 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 111 and 112 were assumed to support great crested newt at the time of the ES assessment and habitats associated with pond New AC would be in the low risk zone.) (Ponds 111, 112, and New AC 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		
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 and 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 but sub-optimal habitat recorded between: 56+600 - 56+700 EB, 56+500 - 56+600 WB, 56+200 - 56+300 EB, 56+100 - 56+200 WB, 55+800 - 56+000 WB, 55+000 - 55+200 EB, 53+775 - 54+625 WB, 53+000 - 53+100 WB, and 52+500 - 52+800 WB No reptiles were translocated.	Local	Habitat loss	Displacement	Slight adverse Displacement of individuals (Phased vegetation clearance 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.)		
Birds	Local	Habitat loss	Seasonal avoidance (or pre-construction survey) Replanting	Neutral No residual effects	Neutral No residual effects (No change to effects on birds.)	None	Local	Habitat loss	Seasonal avoidance (or pre-construction survey) Replanting	Neutral No residual effects (No change to effects on birds.)		

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	
Bats	County	Disturbance (within roost) Disturbance (foraging/commuting) Habitat loss	Pre-construction survey Seasonal avoidance Avoidance of night working Minimising light spill Replanting	Neutral Limited and temporary disturbance	Neutral Limited and temporary disturbance (Mitigation measures remain sufficient to avoid significant impacts, and thereby not require a bat European Protected Species licence.) (Replanting would offset habitat loss.)	Tree X159 with moderate bat roost suitability recorded at 53+480 Tree X086 with moderate bat roost suitability recorded at 53+400 Pound Green Road Overbridge at 56+682 upgraded to possible bat roost Foundry Brook Culvert at 56+550 downgraded to low bat roost suitability (historic roost) Shinfield Road Overbridge at 53+218 upgraded to possible bat roost	Local (No longer any confirmed bat roosts present.)	Disturbance (within roost) Disturbance (foraging/commuting) Habitat loss	Pre-construction survey Seasonal avoidance Avoidance of night working Minimising light spill Replanting	Neutral Limited and temporary disturbance (Mitigation measures remain sufficient to avoid significant impacts, and thereby not require a bat European Protected Species licence. Works at Pound Green Road Overbridge and Shinfield Road Overbridge comprise pier encapsulation only - negligible disturbance.) (Replanting would offset habitat loss.)	
Water vole	Local	Pollution	Pre-construction survey Best practice pollution prevention and control	Neutral No residual effects	Neutral No residual effects (No change to effects on water vole.)	None	Local	Pollution	Pre-construction survey Best practice pollution prevention and control	Neutral No residual effects (No change to effects on water vole.)	

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 prevention and 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 Best practice pollution prevention and control	Neutral Minimal disturbance (foraging/commuting) (No change to effects on otter.)		

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		
Badger	Local	Habitat loss	Replanting	Neutral No residual effects	Neutral No residual effects (Replanting would offset habitat loss.)	Sett 54, a partially used outlier sett, sett 53, an active outlier sett, and sett 52, a disused outlier sett, at 56+550 EB, no longer present Sett 51, a disused outlier sett (now closed), at 55+800 WB Sett 50, a main sett, at 55+750 WB, now disused Sett 137, a disused subsidiary sett, recorded at 54+875 (within J11) Sett 142, at 53+450 EB, scoped out Sett 48, at 53+400 WB, no longer present Sett ECoWSumm16 L, a disused sett outlier, recorded at 53+250 EB Sett Z-17, a disused subsidiary sett (now closed), at 53+250 EB Sett 2020-TEC-02, a disused outlier sett, recorded at 52+950 EB	Local	Habitat loss	Replanting	Neutral No residual effects (Replanting would offset habitat loss.)		

Table 6 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):

- Wood Lane Overbridge (western end) - #1
- Junction 6 - #2
- Slough Road Underbridge (eastern end) - #3

The following sensitive visual receptors were identified within the ES:

- Listed Building 528, 519, 525 - #4
- Residential properties Reading - #5
- Public Rights of Way (PRoWs) west of Junction 11 - #6
- PRoWs east of Junction 11 - #7
- Whitley Wood - #8



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 11 falls within the links of junction 12 to 11 – North Wessex Downs AONB and junction 10 to 8/9 – NCA 115 (Thames Valley).

Table 7 below presents the residual effects assessment for junction 12 to 11 and junction 10 to 8/9, taken from Table 8.2 of the ES.

	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect
Scheme Link	Junction 12 to 11 – North Wessex Downs AONB and Junction 10 to 8/9 – NCA 115 (Thames Valley)			
Temporary Impacts (Construction)	Construction impacts resulting from overbridge realignments, earthworks strengthening and new gantries And vegetation clearance.	Landscape receptors: LCA I3: Grazeley Farmed Clay Lowland. Urban Areas. Visual Receptors: Listed Building 528, 519, 525 residential properties Reading EB and WB Public Rights of Way (PRoWs) west of Junction 11 PRoWs east of Junction 11 Whitley Wood	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 Slight Adverse Visual amenity Slight adverse for users of PRoW.
Permanent Impacts (Operation)	Construction impacts resulting from local vegetation removal, the installation of gantries on embankment	Landscape receptors: None affected. Visual Receptors: Listed Building 528, 519, 525 residential properties Reading EB and WB Public Rights of Way (PRoWs) west of Junction 11 PRoWs east of Junction 11 Whitley Wood	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 to moderate adverse for residential within the urban area (Whitley Wood). Slight adverse for users of PRoW.
Cumulative Impacts	Solar energy scheme and other minor development within the rural area and retail and commercial development	None affected	None required	Neutral

	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect
Scheme Link	Junction 12 to 11 – North Wessex Downs AONB and Junction 10 to 8/9 – NCA 115 (Thames Valley)			
	within the urban area. Major new residential and commercial development to south and southeast of junction 11 between Three Mile Cross and Shinfield.			

Table 7 Residual effects assessment for junction 12 to 11 and junction 10 to 8/9, 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 8, 9 and 10 with a summary of the changes provided below.

Change to Vegetation Clearance

Listed Building 528: Minor additional vegetation clearance on the westbound between the listed building and the M4.

Listed Building 519: No change.

Listed Building 525: Minor additional vegetation clearance on the westbound between the listed building and the M4.

Residential properties Reading:

Eastbound:

- Ch 56400-56000: minor additional vegetation clearance.
- Ch 56000-55000: Minor additional vegetation clearance.
- Ch 54700 53000: Minor additional vegetation clearance.

Westbound:

- Ch 53800-53100: Minor additional vegetation clearance.

PRoWs west of Junction 11: No additional vegetation clearance.

PRoWs east of Junction 11:

- Eastbound: Minor additional vegetation clearance.
- Westbound: Minor additional vegetation clearance.

South End of Whitley Wood: Minor additional vegetation clearance.

Change to Landscape Proposals

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

Change to Gantries - Visual Amenity

G8-17: slight adverse as now closer to residential properties.

All other gantries: no change to original assessment.

Stage 3

The following development has been identified which is now under construction or has obtained planning consent and is therefore changing the ES baseline in regard to cumulative effects:

#1

Reading Gateway

Imperial Way, Reading RG2 0DA, Bewley Homes.

Number of homes – Assumed 151 Homes

Under construction

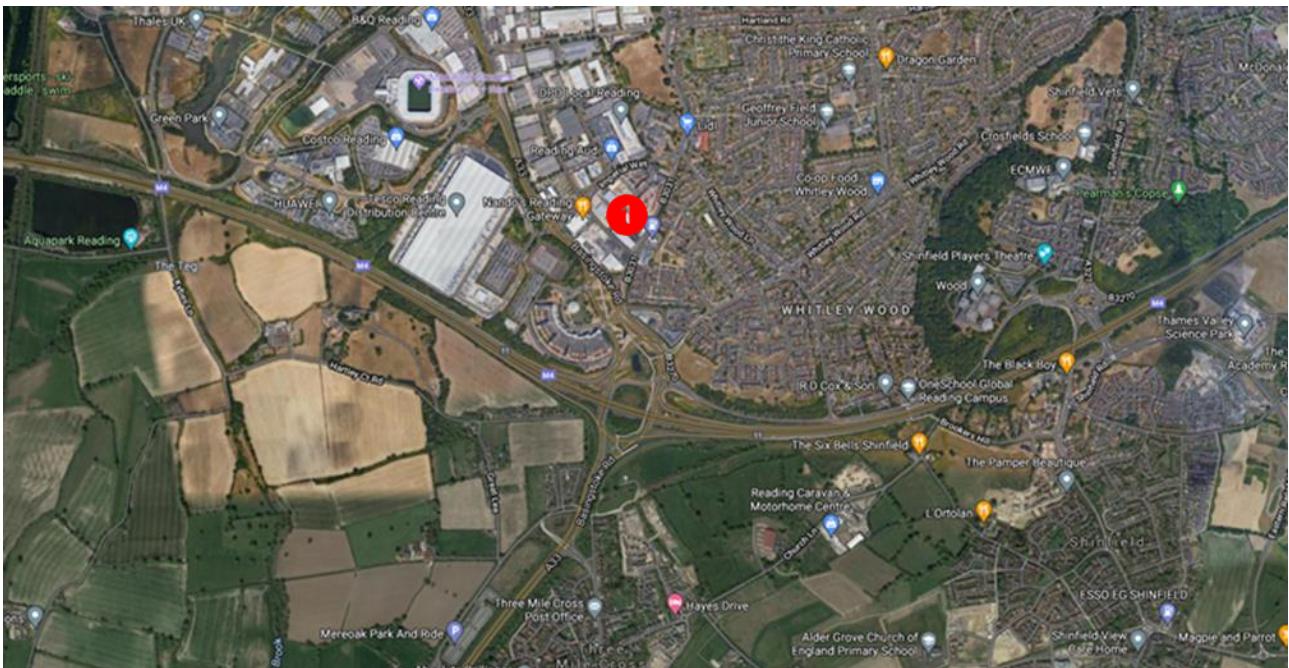


Figure 8 Aerial Image of assessment area showing indicative location of new sensitive receptors.

Stage 4

Tables 8, 9 and 10 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 12 to 11 – North Wessex Downs AONB and Junction 10 to 8/9 – NCA 115 (Thames Valley)									
Temporary Impacts (Construction)	Construction impacts resulting from overbridge realignments, earthworks strengthening and new gantries And vegetation clearance.	<u>Landscape Receptors:</u> LCA 13: Grazeley Farmed Clay Lowland. Urban Areas. <u>Visual Receptors:</u> Listed Building 528, 519, 525 Residential properties Reading Public Rights of Way (PRoWs) west of Junction 11 PRoWs east of Junction 11 Whitley Wood	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> Slight adverse Slight adverse in urban area <u>Visual amenity</u> Slight adverse	<u>Landscape</u> Slight adverse Slight adverse in urban area <u>Visual amenity</u> Slight 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> Slight adverse Slight adverse in urban area <u>Visual amenity</u> Slight adverse Although some changes to vegetation clearance, no change of landscape character as the area has still varying levels of tranquillity, with the busy M4 cutting the landscape and creating a significant visual and audible impact. The M4 dissects the character area centrally, and provides a major transport corridor through the landscape.	The conclusion of the ES assessment remains valid

Table 8 Temporary Landscape and Visual Impacts during Construction

Permanent Impacts during Operation

	Summary of ES Assessment of '2015 DCO Design'				Summary of '2021 NMC Design' change assessment using ES baseline	Changes to ES baseline	Summary of '2021 NMC Design' change assessment using current baseline			Comments
	Impact Description	Receptors Affected	Mitigation	Significance of Residual Effect	Significance of Residual Effect		Impact Description	Mitigation	Significance of Residual Effect	
Scheme Link	Junction 12 to 11 – North Wessex Downs AONB and Junction 10 to 8/9 – NCA 115 (Thames Valley)									
Permanent Impacts (Operation)	Construction impacts resulting from local vegetation removal, the installation of gantries on embankment	<u>Landscape Receptors:</u> None affected <u>Visual Receptors:</u> Listed Building 528, 519, 525 Residential properties Reading Public Rights of Way (PRoWs) west of Junction 11 PRoWs east of Junction 11 Whitley Wood	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 Slight adverse to moderate adverse for residential within the urban area (Whitley Wood).	<u>Landscape</u> Slight adverse <u>Visual amenity</u> Slight adverse Slight adverse to moderate adverse for residential within the urban area (Whitley Wood).	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> Slight adverse <u>Visual amenity</u> Slight adverse Slight adverse to moderate adverse for residential within the urban area (Whitley Wood). Although some changes to vegetation clearance, no change of landscape character as the area has still varying levels of tranquillity, with the busy M4 cutting the landscape and creating a significant visual and audible impact. The M4 dissects the character area centrally, and provides a major transport corridor through the landscape	The conclusion of the ES assessment remains valid

Table 9 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 12 to 11 – North Wessex Downs AONB and Junction 10 to 8/9 – NCA 115 (Thames Valley)									
Cumulative Impacts	<p>Solar energy scheme and other minor development within the rural area and retail and commercial development within the urban area.</p> <p>Major new residential and commercial development to south and southeast of junction 11 between Three Mile Cross and Shinfield.</p>	<p><u>Landscape Receptors:</u> None affected</p> <p><u>Visual Receptors:</u> None affected</p>	None required	<p><u>Landscape</u> Neutral</p> <p><u>Visual amenity</u> Neutral</p>	<p><u>Landscape</u> Neutral</p> <p><u>Visual amenity</u> Neutral</p>	<p><u>Landscape</u> New Development: Reading Gateway Under construction</p>	<p><u>Landscape</u> New development are located 550m m south of the M4.</p> <p><u>Visual:</u> For the new development, existing vegetation and residential areas provide visual buffer to the M4.</p>	None required	<p><u>Landscape</u> Neutral</p> <p><u>Visual amenity</u> Neutral</p>	The conclusion of the ES assessment remains valid

Table 10 Cumulative Landscape and Visual Impacts

Summary

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

Listed Building 528: Minor additional vegetation clearance on the westbound between the listed building and the M4. Slight adverse effect due to additional vegetation clearance.

Listed Building 519: No change.

Listed Building 525: Minor additional vegetation clearance on the westbound between the listed building and the M4. Slight adverse effect due to additional vegetation clearance.

Residential properties Reading eastbound and westbound:

Eastbound:

Ch 56400-56000: additional vegetation clearance. Moderate adverse effect due to additional vegetation clearance as limited existing vegetation outside the Order limits remains as visual screening.

Ch 56000-55000: Minor additional vegetation clearance. Slight adverse effect due to additional vegetation clearance as existing vegetation outside the Order limits remains as visual screening.

Ch 54700 53000: Minor additional vegetation clearance. Slight adverse effect due to additional vegetation clearance as existing vegetation outside the Order limits remains as visual screening.

Westbound:

Ch 53800-53100: Minor additional vegetation clearance. Slight adverse effect due to additional vegetation clearance as existing vegetation outside the Order limits remains as visual screening.

Public Rights of Ways west of Junction 11: No change.

Public Rights of Ways east of Junction 11:

Eastbound: Minor additional vegetation clearance, therefore slight adverse effect due to additional vegetation clearance.

Westbound: Minor additional vegetation clearance, therefore slight adverse effect due to additional vegetation clearance.

South End of Whitley Wood:

Minor additional vegetation clearance, therefore slight adverse effect due to additional vegetation clearance.

Although minor additional vegetation clearance in some places, the landscape proposals provide mitigation planting wherever possible to ensure that screening to sensitive receptors is provided or existing vegetation outside the Order limits acts as visual screening.

- Regarding permanent impacts during operation, it is concluded that there are slight adverse effects at: Listed Building 528.
- Listed Building 525.
- Reading residential areas eastbound at Ch 56000-55000 and Ch 54700 53000, westbound at Ch 53800-53100.
- PRowS east of Junction 11, eastbound and westbound.
- South end of Whitley Wood.
- Residential properties Reading eastbound at Ch 56400-56000.

Gantries:

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

G8-17: Stays neutral as, although closer to non-residential property (buildings are not existing anymore), existing vegetation can buffer views to the new gantry location.

All gantries: no change to assessment presented in the ES.

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

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

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 waterbodies local to junction 11 (Clayhill Brook and Foundry Brook), there has been no change or a degradation in some aspects of water quality that are monitored under the WFD. The WFD groundwater body (the Berkshire Downs Chalk) is at the same status as reported in the ES.

With regards to flood risk between junction 11 and junction 10, there have been no changes to the spatial extents of Flood Zones 2 (medium risk) and 3 (high risk). The flood zones associated with the Clayhill Brook are less extensive on the present-day flood map, particularly the extent of Flood Zone 2.

Changes in the baseline qualities of water environment receptors local to junction 11 are limited. The value/sensitivity assigned to receptors, in accordance with the criteria set out in Table 15.2 of the ES, would be the same or lower.

Review of Design Changes

The 2021 NMC Design is located within Environment Agency Flood Zone 1, defined as having an annual probability of flooding from rivers and the sea of less than 0.1%. The 2021 NMC Design will therefore not affect any fluvial floodplains. No watercourses flow perpendicular to the motorway at junction 11, and new watercourse crossings at this location were not part of the assessment presented in the ES. The 2021 NMC Design does not change this. The effects of the 2021 NMC Design on flood impacts are therefore neutral.

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 small (see Section 9.1). Consequently, there would be a very 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 11, the accidental spillage risk assessment confirmed that the risk level is acceptable, and no further spillage containment or mitigation measures are necessary to prevent baseline water quality deterioration. Groundwater pollution risk assessments demonstrate that the 2021 NMC Design would result in risks that are no worse than existing risks.

For surface waters receiving routine runoff, the assessments have also demonstrated that long-term statutory water quality standards, defined by the Environmental Quality Standards for dissolved copper and zinc, are met. Short-term impacts are defined by runoff specific thresholds

² Environment Agency - Catchment Data Explorer

(RSTs) for dissolved copper and zinc. At some outfalls, the drainage design delivers improvements, whilst at other outfalls, RST exceedances were similar to and no worse than baseline conditions. A small number of outfalls fail RST thresholds; however, no further treatment can feasibly be provided within the land take constraints that apply. The failures are not a consequence of the 2021 NMC Design. Ecological walkover surveys of the receiving watercourses subject to these RST failures have also confirmed that there is no evidence of active aquatic habitats that would be put risk from exceedances of RSTs.

The DMRB HD 45/09 assessments therefore confirm that the impact of the 2021 NMC Design on water quality would be neutral overall, albeit with short term minor adverse effects local to a small number of outfalls. The conclusions of ES remain valid.

The 2021 NMC Design is not situated within a groundwater SPZ and the underlying geology does not support any Principal Aquifers. The 2021 NMC Design does not therefore change impacts on groundwater levels, flows or quality and the effects of the 2021 NMC Design on groundwater are neutral.

Cumulative Change Assessment

The ES presented a cumulative assessment of other developments located within 1km of the scheme. The potential for increases in flood risk associated with the cumulative increase in impermeable land cover and loss of floodplain storage was considered, as well as degradation of the quality of waterbodies. The assessment concluded no significant cumulative effects on the water environment.

There are no changes to the conclusions of this assessment. This is because, in line with Environment Agency policies, new developments are required to restrict runoff to greenfield rates, measures are required to treat runoff to achieve suitable quality standards and any losses of floodplain storage must be compensated for to achieve planning policy compliance, and the 2021 NMC Design also achieves these requirements.

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 due to a reduction in impermeable land cover and the scope of earthworks required, and therefore the assessment and conclusions presented in the ES remain valid.

10 Conclusion

Through traffic modelling, safety and environmental change assessments, and considering customer disruption, it has been found that the most suitable solution for junction 11 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. Furthermore, the potential safety implications of traffic queuing on the diverge slip road and mainline are reduced through the adoption of a No TJR layout.

As a result of adopting a No TJR arrangement at junction 11, 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 at 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
G9-07	56947	8.6	New	Neutral	Neutral	Set in context of adjacent trees, woodland block outside the Order limits and remote from high sensitivity receptors
G9-04	56355	8.6	New	Neutral	Neutral	Set in the context of adjacent trees, woodland block outside the Order limits and remote from high sensitivity receptors
G9-02 WB	55855	13.0	New	Slight adverse	Neutral	Visible from adjacent residential properties (westbound). No impact (eastbound)
G9-02 EB	55855	13.5				
G8-22a	53873	9.3	New	Slight adverse	Neutral	Potentially visible from adjacent residential properties (eastbound)
G8-22b	53580	9.2	New	Neutral	Neutral	Set in the context of retained vegetation and other vegetation outside the Order limits
G8-17	52715	8.6	New	Neutral	Neutral	WB: Set in context of adjacent evergreen trees outside the Order limits and therefore hidden from high sensitivity receptors

Table 11 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
G9-07	56883	8.6	New	Neutral	Neutral	Moved west by 69 m, similar environment
G9-04	56293	8.6	New	Neutral	Neutral	Moved by east 62 m
G9-02 WB	55628	13	New	Slight adverse	Neutral	Gantry moved east by 227 m. It is now potentially visible from adjacent residential properties (westbound) of Hartley Court Road. There is no impact on the eastbound carriageway side of the gantry.
G8-22a	53872	9.3	New	Slight adverse	Neutral	The MS4 from G8-22b has moved onto G8-22a, no perceptible change in the view from adjacent property due to existing vegetation acting as visual buffer.
G8-22b	53558	N/A	Removed	Neutral	Neutral	Gantry removed from scheme
G8-17	52778	8.6	new	Slight adverse	Neutral	Gantry has moved west by 66 m closer to properties (moderate sensitivity) on westbound carriageway, with limited deterioration to a view from those receptors

Table 12 2022 Gantry Visual Change Assessment