Appendix 21
M1 Junction 15: Summary of Highway Options Report

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Northampton Gateway SRFI

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DOCUMENT ISSUE RECORD

Revision	Date of Issue	Status	Author:	Checked:	Approved:
1	11.09.17	Preliminary Issue	A. Darby	S. Hilditch	S. Hilditch
			BSc(Hons) MA FRICS MCIHT MAPM	MEng (Hons) CEng MICE MCIHT	MEng (Hons) CEng MICE MCIHT
2	04.01.18	Updated following review	A Darby	S. Hilditch	S. Hilditch
3	10.01.18	With ADC comments	S. Hilditch	S. Hilditch	S. Hilditch
4	01.05.18	Final issue	S. Hilditch	S. Hilditch	S. Hilditch

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1.0 INTRODUCTION

1.1 BWB Consulting (BWB) have been instructed by Roxhill (the Client) to prepare a report that summarises the options reviewed for the M1 Junction 15 highway works associated with the proposed Northampton Gateway Strategic Rail Freight Interchange (NG SRFI). Those works are referred to in this report as the proposed M1J15 highway works.

1.2 The site of NG SRFI is located immediately west of M1 J15 in Northamptonshire and will be accessed via a new roundabout on the A508 Northampton Road.

1.3 ADC Infrastructure have undertaken extensive option testing modelling at M1 J15 to sufficiently advance the highway mitigation proposals at the junction, allowing the proposals to be tested as part of the strategic transport modelling. This work was summarised in Technical Note 5 (TA Appendix 10 ref. ADC1475 TN05 v5).

1.4 Technical Note 5 demonstrates that M1 J15 suffers from severe levels of congestion in the morning and evening peak hours, and that the impact on junction performance due to the proposed development would be significant and therefore a comprehensive mitigation scheme is required. Technical Note 5 presents the evolution of the M1 J15 mitigation design and details the junction modelling that has informed the design process.

1.5 This report has been prepared to provide further detail regarding the decision-making that went in to the development of the NG SRFI proposed J15 highway works. Cross references to the Technical Note 5 and its appendices are made at several points in this report.

1.6 The proposed highway works are those defined in the draft Development Consent Order and are shown as Work Nos. 6, 7 and 8 on the Works Key Plan (Document 2.2, Drawing NGW-BWB-LSI-XX-DR-C-160). They comprise the improvement of M1 J15 by the modification of motorway slip roads and all-purpose interchange connecting roads and associated highway improvements to the A45 trunk road and the A508 including the construction of an access to the NG SRFI from the latter.

1.7 The highway works have been developed in consultation with the Transport Working Group which include the strategic highway authority Highways England and the local highway authority Northamptonshire County Council.

Ongoing Improvement Works in the Surrounding Area

1.8 North of Junction 16, the M1 has recently been improved as part of the Highways England 'smart motorways'[1] programme, whereby the motorway is converted to dual four-lane running by bringing the hard shoulder into use as a running lane.

1.9 A similar scheme is in preparation for the section from Junction 16 to Junction 13 and construction is due to start in Spring 2018.

Overall Objective

1.10 Whilst the primary objective for the highway works at M1 J15 is to mitigate the impacts of the traffic from the NG SRFI, this is to be done with due consideration to the operation of the strategic road network and of the local road network, access to local population

[1] Smart motorways use active traffic management to make use of hard shoulder running and variable speed limits to increase capacity during busy times.

centres, the needs of non-motorised users and access to third party land interests. This report is structured around meeting this objective.

Detailed Engineering Considerations

1.11 Once the principles of the overall junction improvements had been set, there are a series of detailed engineering considerations that were given to providing the most suitable overall design for the scheme.

1.12 For M1 J15 the detailed engineering design is assessed in the J15 J15A A45 Geometric Design Strategy Record (TA Appendix 28).

1.13 For the A508 the detailed engineering design is assessed in the A508 Route Upgrade Geometric Design Strategy Record (TA Appendix 29).

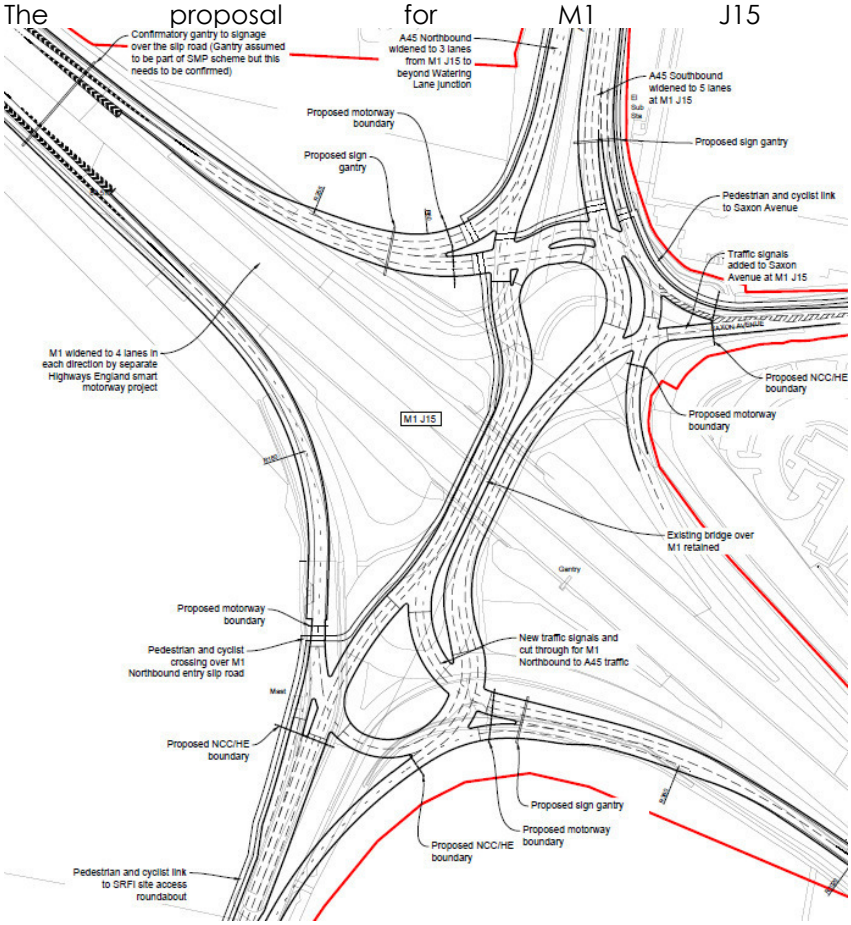
2.0 MACRO SCALE HIGHWAY IMPROVEMENTS

M1 J15 Highway Works

2.1 The current arrangement of M1 J15 was created in 1998 by a scheme which removed the original two-bridge roundabout in favour of the extant dumbbell-type arrangement comprising two partial roundabouts linked by a dual three-lane carriageway traversing a single bridge. Given the relative youth and high intrinsic capacity of the major bridge structure at the heart of the junction, it was considered that, if possible, a solution should be sought which retained that bridge.

Option Adopted

2.2 The proposal for M1 J15 shown at



2.3 **Figure** 1 has been developed to consist of the following elements:

- Retention of the 1998 bridge to provide the sole cross-motorway links northbound and southbound between A45 and A508 and the slip roads.
- Conversion of the dumbbell roundabouts to larger signalised gyratories, with a cut-through for the M1 northbound to A45 traffic movement at the southern roundabout.
- Widening and realignment of the M1 slip roads as necessary.
- Segregation of left turns in three quadrants.

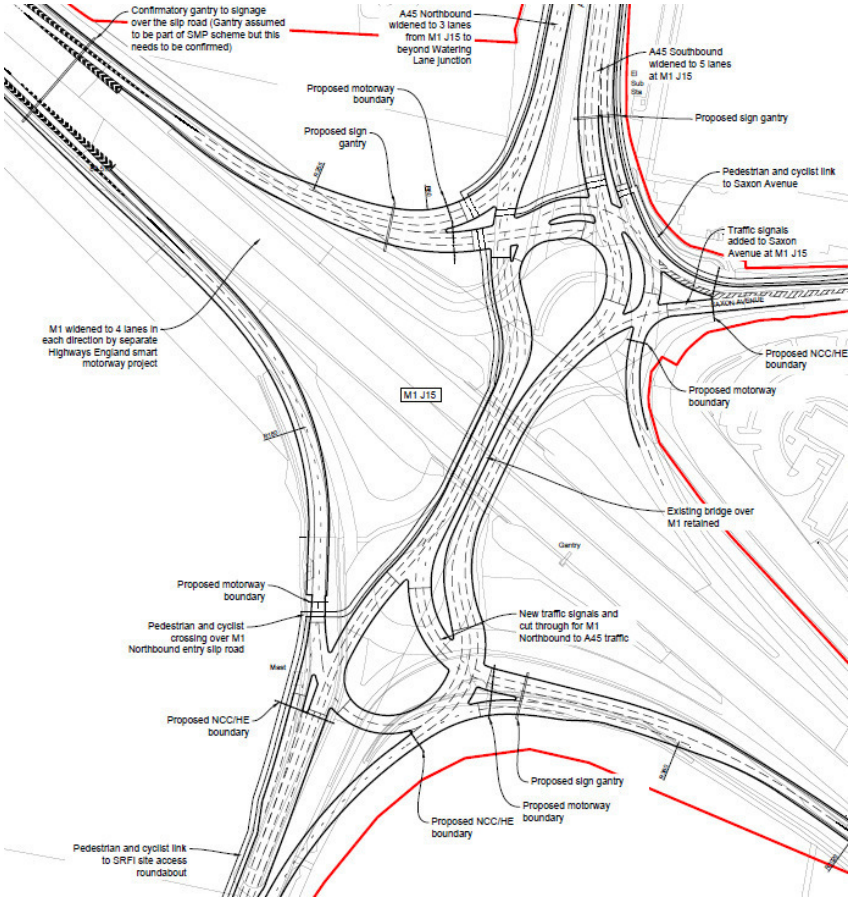


Figure 1 – M1 J15 NG SRFI Option Selected

Options Discounted

2.4 Consideration was given to a major upgrade of the junction to include further grade separation to create free-flow links. However, such a solution would be highly environmentally intrusive and increase the required land-take. Free-flow links could have been provided between the A45 and the M1 northbound and/or between the M1 northbound and the A45. Depending on the configuration, this would have required a new major structure crossing the M1 and extensive adjustment of one northbound slip road or both of them and associated earthworks, with significant additional land-take west of the motorway and some additional land-take east of it. As a lower-scale, less intrusive option has been shown to be capable of meeting the traffic demand, this variety of solution has been discounted.

2.5 Reversion to a two-bridge roundabout arrangement was also considered. Such a solution could offer the additional junction capacity needed to meet the needs arising from the NG SRFI, but would require demolition of the current high-capacity single bridge in favour of two bridges or alternatively removal of the junction northwards or southwards to allow incorporation of the current bridge into a two-bridge arrangement. The former possibility would be wasteful and disruptive to traffic to construct, while the latter would greatly increase land-take; and both would pose problems in tying the slip roads into the motorway mainline and the widening or reconstruction of bridges. As a layout has been devised which offers the required cross-motorway and all-movements interchange capacity with retention of the current bridge in its dual three-lane configuration, such options have been rejected as unnecessarily disruptive.

3.0 GENERAL ARRANGEMENT CONSIDERATIONS

M1 Junction 15

3.1 M1 J15 currently comprises a modified dumbbell arrangement with diamond-configured slip roads linked by two partial roundabouts and a single dual three-lane carriageway carried on a bridge over the motorway.

3.2 As noted above the option to be adopted is retention of the existing bridge and enlargement of the junction to the north and south of the M1. With this in mind, consideration has been given to how this should be achieved.

Option Adopted

3.3 The arrangement adopted for junction 15 as shown in **Figure 1** is the conversion of the dumbbell roundabouts to larger signalised gyratories with a cut-through for the M1 northbound to A45 traffic movement at the southern roundabout, together with widening and realignment of the M1 exit slip roads, reflecting the changed mainline diverge configuration arising under the smart motorway design, and adjustment of the northbound entry slip road. Segregation of left turns is also provided in three quadrants.

Options Discounted

3.4 Converting the southern roundabout to a conventional signal-controlled junction was considered but rejected due to concerns about the magnitude and complexity of the junction layout arising and the resulting difficulty in signing the layout and driver navigation through it. A similar approach was considered to the northern roundabout, and was rejected for similar reasons and because of the added complexity of the junction arising from the presence of the Saxon Avenue arm.

3.5 The possibility of providing a free-flow link from the A508 to the M1 northbound entry slip road was considered, but the arrangement was regarded as incompatible with the pedestrian and cycle crossing at that location and with the ghost island merge onto the M1 given the restricted slip road length, as it is likely that undesirable weaving manoeuvres would arise on the slip road.

3.6 Likewise the possibility was considered of providing a free-flow link from the M1 northbound exit slip road to the A508. However, analysis suggested that such an arrangement, which would somewhat increase land-take, would provide little benefit to traffic.

3.7 A free-flow link from the M1 southbound exit slip road to the A45 was considered, but this raised concerns due to the short distance between it and the upstream ghost island diverge from the M1 and the downstream Watering Lane junction. Moreover, analysis indicated that three lanes were required northbound over the bridge from the M1 northbound exit slip road and A508 towards the A45.

3.8 The adoption of a conventional roundabout on the north side was rejected due to the land take requirements as the roundabout would be large due to the number of lanes on each approach.

3.9 As regards the southern roundabout, a conventional roundabout solution was rejected as it would insert a redundant portion of circulatory carriageway, adding complexity to no traffic benefit.

3.10 The possibility of fully closing Saxon Avenue at the northern roundabout was considered, but this was rejected on environmental, economic and traffic grounds as it would require HGVs exiting and entering the industrial estate to proceed via the

residential area to the north. Furthermore, other local businesses and residents would also have to use this route representing a significant increase in trip length to and from M1 J15.

3.11 An option to provide a direct turning movement from Savon Avenue to the A45 was rejected on capacity grounds as described in report Technical Note 5.

3.12 The idea of providing a cut-through at the north roundabout from the M1 southbound exit slip road towards the A508 was rejected as detailed in Technical Note 5. Analysis showed that it would not deliver a significant capacity benefit, but would create a dense network of short links which could be difficult to maintain. This was discussed with the HE Asset Management Team who agreed that no cut-through should be provided at the northern roundabout.

A45 Watering Lane Junction

3.13 Retention of the Watering Lane major/minor priority junction with A45 was considered but rejected on safety grounds; similarly, an option to provide a modified Watering Lane junction with a retained right turn off the A45 (right turn onto A45 closed) was rejected due to the complex geometry required on the A45 in close proximity to Junction 15.

3.14 A three-into-two merge on the A45 exit from Junction 15 was entertained, but analysis suggested that a three-lane exit onto A45 was required, with the three-lane carriageway extending beyond the Watering Lane junction to provide sufficient merge space away from J15.

3.15 An option to provide an auxiliary lane between J15 and Watering Lane, with a lane drop at Watering Lane, was considered. However, this was discounted on the basis of there being a very low flow into Watering Lane and having a lane drop could result in unequal lane usage around J15.

3.16 As a result of the above, it is considered that signalisation of the Watering Lane junction is required in order to provide a safe junction with 3 lanes continuing on the A45 Northbound and merging into two lanes thereafter.

NG SRFI Access and A508

3.17 The A508 is current a rural single carriageway road south of Junction to the outskirts of Roade. There is no junction corresponding with the location of the SRFI.

3.18 The adopted option comprises an unsignalised roundabout for the NG SRFI access and dualling of the A508 between the SRFI junction and M1 J15. A '3+2' configuration will be provided, affording three lanes northbound and two southbound, the nearside northbound lane being gained via a free-flow left turn from the SRFI access road to the A508. The layout is shown at **Error! Reference source not found.**.

3.19 The free flow lane is provided as there is a very high left turning flow and, in addition, all HGVs from the SRFI are to be directed to M1 J15 and prohibited from travelling south onto the A508.

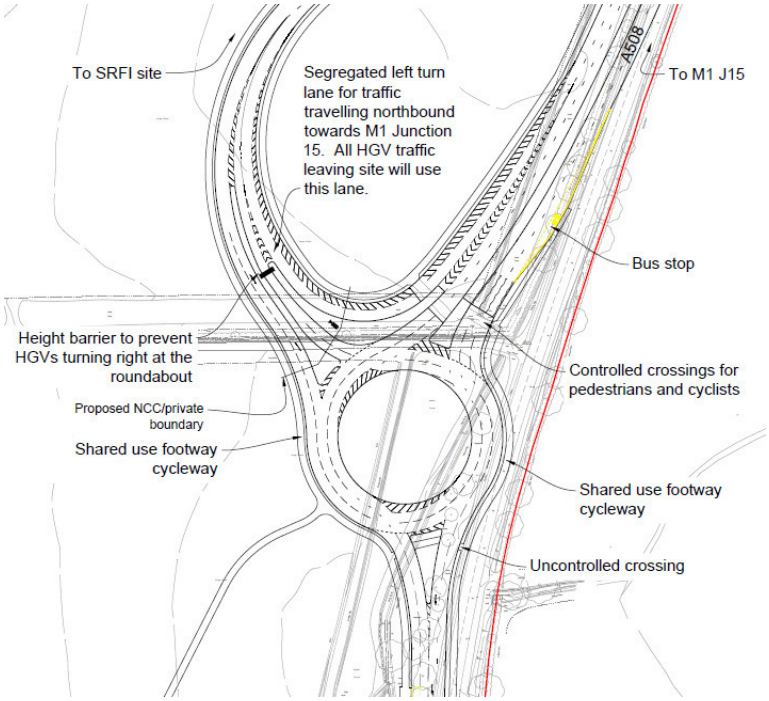


Figure 2 – A508 SRFI Access

Other layout considerations

3.20 A detailed assessment for the needs of pedestrians, cyclists and equestrians has been undertaken and recorded in the Walking, Cycling, Horse Riding Assessment Report found at TA Appendix 18. The proposed NG SRFI scheme has been assessed against this report and recorded in the Walking, Cycling, Horse Riding Review Report found at TA Appendix 19.

3.21 Provision for bus stops has been considered including relocation of existing stops away from the A45. This is dealt with in the Public Transport strategy which is found at TA Appendix 2.

3.22 The scheme would require removal of the existing parking lay-by on the A45 and a detailed assessment of this is found at TA Appendix 14.

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