M42 Junction 6 Improvement

Scheme Assessment Report

SGAR2 Option Selection

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Executive Summary

M42 Junction 6 is a crucial junction on the strategic road network (SRN) and sits within the section of M42 which forms the southern and eastern arms of the Birmingham Box area on the SRN. M42 Junction 6 provides a link between the M42 Motorway and A45 Coventry Road and also provides strategic access to Birmingham (to the west) and Coventry (to the east). Junction 6 lies on the eastern edge of Birmingham, approximately 9 miles from the city centre, with its nearest town being Solihull.

M42 Junction 6 also lies at the heart of an area of dynamic growth and is surrounded by a unique mix of key strategic economic assets for both the local and wider community. It provides the main access to an expanding Birmingham Airport, Jaguar Land Rover (JLR), Birmingham International Railway Station, the National Exhibition Centre (NEC), the National Motorcycle Museum and National Conference Centre (NMM) and Birmingham Business Park. It will also be used by additional traffic generated by the proposed High Speed Two (HS2) Interchange Station and the proposed UK Central (UKC) development to the immediate north-east of the junction being promoted by Solihull Metropolitan Borough Council (SMBC). There is also a planning proposal for a new motorway service area (MSA) on the M42, which may need to be incorporated into the scheme, if it obtains planning approval.

Current congestion and journey reliability issues at Junction 6 are constraining investment and economic growth. Without infrastructure investment to improve the junction a major investment opportunity of national significance could be lost.

These issues were identified to the Department for Transport (DfT) in 2014 who then commissioned Highways England to undertake junction improvements as part of the DfT's Road Investment Strategy (RIS) 2015-20. The DfT brief for these improvement works is:

> "*…comprehensive upgrade of the M42 junction 6 near Birmingham Airport, allowing better movement of traffic on and off the A45, supporting access to the airport and preparing capacity for the new HS2 station.*"

Highways England has developed its proposals for the M42 Junction 6 Improvement scheme based on the planned development in the area and to ensure that the proposals would not preclude the future aspirational development currently envisaged in order to maximise the benefits HS2 will bring to the Midlands.

The Technical Appraisal Report (TAR) documented the Options Identification stage of the project. It provided details of the existing assets and congestion problem at M42 Junction 6, identified many constraints surrounding the junction, explained the process by which an initial set of forty options was sifted down to three to take to public consultation and provided an assessment to justify the final selection. The work done to assess the various options identified in the TAR demonstrates the options taken to public consultation are the only viable options to improve the junction.

The Scheme Assessment Report (SAR) provides feedback from the public consultation and how that was included within the assessment of the final three options from which a recommendation for a preferred option is made for submission to the Secretary of State for Transport. The assessment takes into account environmental, economic, operational and geometric factors within the assessment. The SAR describes how the scheme has developed to the recommended option, identifies the recommended option and explains the reasoning on why it was chosen.

The schemes taken forward to public consultation were all variants of a new southern junction with an additional option of one or more free-flow links around Junction 6:

- Option 1 – Southern Junction 2km south of Junction 6 with a link road to the west of Bickenhill village which connects to the A45 at Clock Interchange;
- Option 2 – Southern Junction 2km south of Junction 6 with a link road to the east of Bickenhill village which connects to the A45 at Clock Interchange via an additional roundabout;
- Option 3 – Southern Junction 1km south of Junction 6 with northbound exit and southbound entry onto the M42 only and link road to the A45 at Clock Interchange via an additional roundabout.

These options had shown traffic benefits, no major safety and geometric concerns, could largely be built offline, provided medium-good value for money and had stakeholder support.

A seven week non-statutory consultation exercise was undertaken between Friday 9 December 2016 and Friday 27 January 2017. The consultation introduced the scheme to stakeholders, constituent residents and the general public, informed them about the option assessment process and sought to gain feedback on the options developed.

Eight exhibitions and one webchat were organised during the consultation to give members of the public and stakeholders an opportunity to find out more about the scheme and the options identified, and to ask members of the project team any questions they had about the project.

The consultation feedback was used in further development of the options assessment process leading to a recommendation on which route option to take forward.

In total, 217 responses were received during the consultation period. 84% of these were completed questionnaires and the remaining 16% were responses as either letters or emails. The results showed 71% agreed or strongly agreed the M42 junction 6 needs to be improved. 16% strongly disagreed or disagreed the junction needs improving and 13% neither agreed nor disagreed. The consultation also showed that 64% of the total responses preferred Option 1 with 15% preferring Option 3 and 10% preferring Option 2; 11% had no preference.

The consultation demonstrated that the addition of free-flow links around junction 6 were supported in general, but will require review during preliminary design in light of ongoing traffic modelling, affordability, effect on businesses and the environment and additional engagement with affected landowners to develop the design.
There were no new alternative options suggested during the consultation period that met the scheme's objectives whilst being both viable and deliverable.

Following the consultation period, additional stakeholder consultations were undertaken to follow up on the concerns and issues raised by a number of parties including the Campaign to Protect Rural England (CPRE), the Gaelic Athletic Association (GAA) and SMBC which influenced the final route selection.

A series of workshops were subsequently held to evaluate the responses from the consultation and carry out an assessment to determine which of the options should be taken forward. A set of criteria was prepared in order to provide a quantitative analysis of the options, the list of high-level criteria is given below:

- Department for Transport (DfT) RIS brief;
- Highways England Imperatives;
- Scheme Economics;
- Public Consultation results;
- Environmental Effects;
- Highways England Key Performance Indicators (KPIs);
- General (stakeholder issues, buildability, number of departures, etc).

The workshops also considered variants to Option 1, designed to mitigate the concerns raised during the Public Consultation. These variants were:

i. Option 1A – an alternative to Option 1 where the alignment deviates to the west of Option 1 to avoid direct impact on the Warwickshire GAA sports fields;
ii. Option 1B – this variation impacts just one of the GAA sports fields;
iii. Option 1C – this option deviates to the east of the GAA sports fields.

The assessment demonstrated that although Option 3 is cheaper, requires less landtake and provides a better Value for Money score. It has a number of issues including geometry, effect on the built environment, and visual effect on the green belt and could preclude future development of M42 Junction 6 if the aspirational development in the area comes forward. These issues outweigh the benefits of Option 3, and consequently this option is not being taken forward as the preferred route. Option 2 also incorporated the disbenefits of both Option 1 and Option 3 resulting in a low BCR and was also not taken forward as the preferred route.

Option 1 is supported by 64% of the stakeholders including the local populace, the MP and local businesses such as Birmingham Airport, NEC, JLR and HS2. It has less impact on the 'openness' of the green belt, provides more resilience to the road network, has the greater potential to minimise the effect on the landscape, supports future medium term aspirational development in the area, and has the potential to be modified to accommodate long term aspirational development. The costs would

also reduce below Option 3 if the proposed MSA obtains their planning permission prior to the scheme's potential start of works, enabling them to make a contribution towards the cost of the southern junction.

The results of the assessment were that Option 1B scored the highest, and it was agreed that Option 1B should be taken forward as the recommended option. The table showing the results of this assessment are included in Appendix E.

Consequently, Option 1B is the preferred option to take forward as Highways England's preferred route.

1 Introduction

1.1 Scheme Background

M42 Junction 6 is a crucial junction on the SRN and sits within the section of M42 which forms the southern and eastern arms of the Birmingham Box area on the SRN. M42 Junction 6 provides a link between the M42 Motorway and A45 Coventry Road and also provides strategic access to Birmingham (to the west) and Coventry (to the east). Junction 6 lies on the eastern edge of Birmingham, approximately 9 miles from the city centre, with its nearest town being Solihull.

The scheme limits extend over the A45 from Clock Interchange (junction with the B4438) in the west to the A452 junction at Stonebridge Island in the east. In the north-south direction, the scheme limits are generally located at the midpoint between Junctions 5-6 in the south and mid-point between Junctions 6-7 in the north.

M42 Junction 6 lies at the heart of an area of dynamic growth and is surrounded by a unique mix of key strategic economic assets for both the local and wider community. It is located just north of Solihull centre and provides the main access to an expanding Birmingham Airport, JLR, Birmingham International Railway Station, the NEC and Birmingham Business Park. Current levels of congestion are having a serious effect on communities and businesses in the area and would constrain the future planned development. If nothing is done, the levels of congestion will continue to get worse, which could impact the long term viability of a number of nationally important assets. Scheme plans are included in Appendices A and B and Constraint Plans are included in Appendix D.

This project is also part of a much larger (£1.63bn) Government / HS2 Growth Strategy being developed with local partners (UKC / Urban Growth Company) to maximise the economic benefits HS2 could bring to the Midlands. These major stakeholders see the development of the junction as crucial to their future success in contributing to the UK's engine for growth through the Midlands HS2 Growth Strategy and to enable / unlock continued investment to the "Midlands Powerhouse".

The 'Road Investment Strategy: for the 2015/16 – 2019/20 Road Period' (RIS1), published in March 2015, indicated the project as a committed new scheme. It was first announced in the Autumn Statement 2014 (AS14), and stated that the M42 Junction 6 Improvement scheme requires a

> *"…comprehensive upgrade of the M42 junction 6 near Birmingham Airport, allowing better movement of traffic on and off the A45, supporting access to the airport and preparing capacity for the new HS2 station."*

1.2 Purpose

To provide a summary of the TAR and the Report on Public Consultation and to recommend a preferred option.

1.3 Constraints

A number of planning factors and related constraints have been identified and considered which severely impacted the development and route selection. Road infrastructure is heavily constrained by the close proximity of adjacent junctions in three out of the four directions from the centre of Junction 6:

- M42 Junction 7 is just over 2km to the north;
- A45/B4438 Clock Interchange is 1km to the west; and
- A45/A452 Stonebridge is 1.5km to the east of Junction 6.

The area around Junction 6 also encompasses major developments such as the Birmingham-Euston railway, the NEC, Birmingham Airport and the National Motorcycle Museum & National Conference Centre (NMM). It also has significant statutory apparatus such as overhead high voltage power pylons (132 and 400kV), a fuel pipeline and aqueduct in the vicinity.

In February 2017, HS2 gained Royal Assent which now confirms the arrival of the HS2 line and the HS2 Birmingham Interchange station for the region. In addition to HS2 and the committed growth, there is also SMBC's plan for the UKC mixed use development immediately to the north-east of the Junction. UKC's Urban Growth Company (UGC) published their Hub Growth and Infrastructure Plan (HGIP) which outlines their plan for future aspirational growth in the area.

To the south of Junction 6 lies the small local communities of Bickenhill, Catherine-de-Barnes and Hampton-in-Arden, all situated within green belt and a generally rural landscape.

1.4 Stakeholder Engagement

A series of meetings were held prior to the public consultation, at an early stage of option development with around 15-20 identified stakeholders between April and July 2016 in order to take their views on board. Stakeholders included the parish councils of Hampton-in-Arden and Bickenhill/Marston Green as well as local businesses such as JLR, NEC, Birmingham Airport and the NMM. Local authorities and the local MP were also consulted. Their feedback on the options presented was utilised within the development of the options towards a shortlist that were taken to the public consultation.

Further stakeholder meetings occurred between November and December 2016 to provide a progress update - including the latest options - and invite further comment, prior to the public consultation period.

A non-statutory public consultation was held between Friday 9 December 2016 and Friday 27 January 2017 with eight exhibitions and one webchat organised. The consultation aimed to introduce the scheme to stakeholders, inform them about the option assessment process and to gain feedback on the options developed. Feedback from the public consultation was used in the ongoing development and assessment of options presented.

2 Summary of Existing Conditions

A fully detailed account of existing conditions is provided in the TAR (document reference: HE551485-MOU-GEN-M42_J6-PC-Z-0007). The information provided in this chapter is a brief summary of what was included in the TAR with some additional information on drainage and non-motorised user (NMU) routes.

2.1 Description of Locality

M42 Junction 6 is part of the SRN which is referred to as the 'Birmingham Box' (M5 on the west side, M6 on the north side, M42 east and south side). Figure 2-1 below presents the M42 in context with other surrounding motorways and trunk roads.

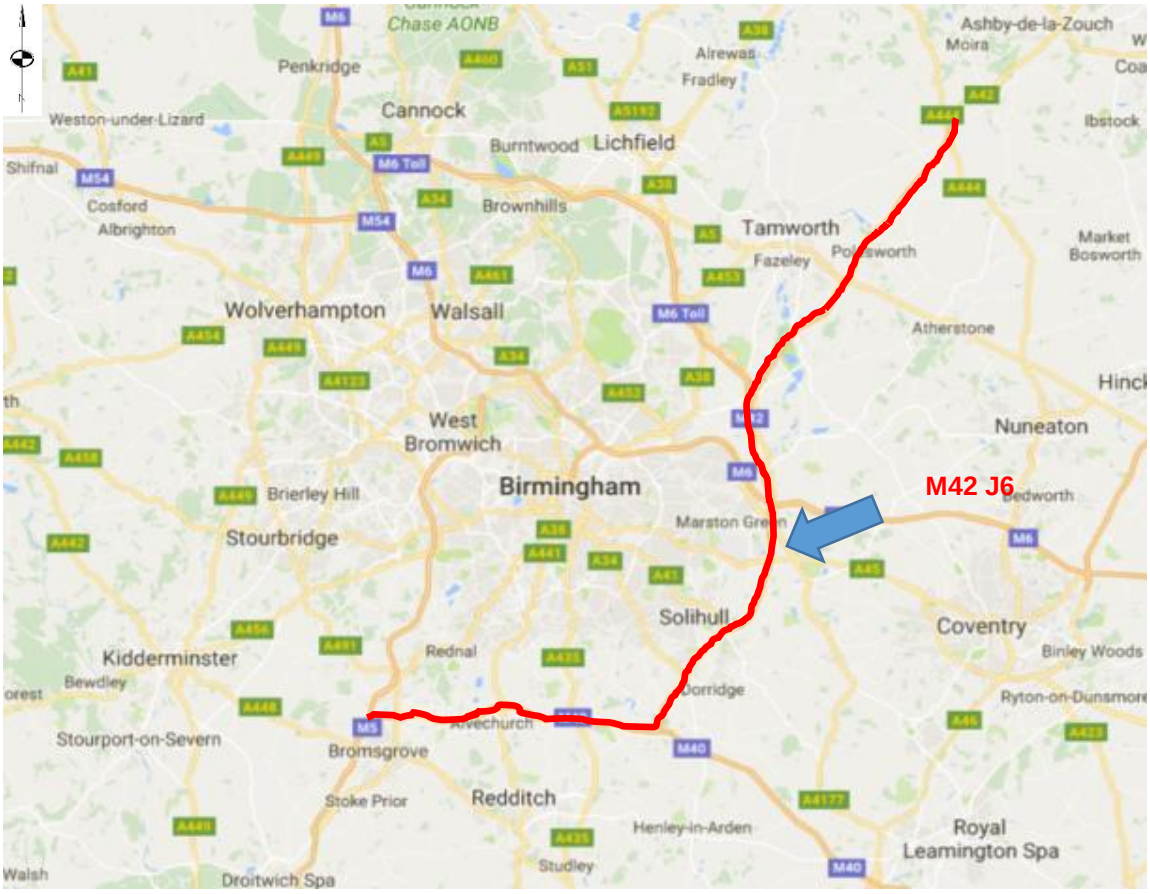


Fig 2.1 General Location of M42 Junction 6 (Google Maps © 2016)

The M42 is a dual 3-lane motorway which runs from the south-west of Birmingham near Bromsgrove, where it connects with the M5, to the north-east of Tamworth where its status changes to the A42 at the A42/A444 Junction. The M42 is 40 miles (64km) in length and runs to the south and east of Birmingham. Redditch, Solihull, Tamworth and various smaller towns are situated close to the M42 corridor. The motorway connects with the M40, M6, M6 (toll) and M5 along its length as well as a number of trunk roads such as the A45 and A41. The M42 forms an important connection between the East and West Midlands via the A42.

The circulatory island at M42 Junction 6 provides both direct and indirect access to a number of major businesses/stakeholders in the area which contribute to the traffic levels at the junction. Access to the NEC and NMM is contained directly on the Junction 6 circulatory – NEC access is controlled by traffic signals, NMM access is uncontrolled. The NEC in particular attracts large traffic volumes on event days which add significantly to the daily traffic levels and potential for congestion at the island. This often leads to lock-ups which can take several hours to clear. Highways England has an emergency response plan prepared for these type of situations but the potential for lock-ups can be unpredictable.

In addition, there is indirect access via the A45 with Birmingham Airport, Birmingham International Railway Station and a number of other businesses/commercial properties nearby. The existing highway along the A45 (eastbound) and approach to Junction 6 towards the NEC access is often subject to congestion not only at NEC events but with commuter traffic combined from Birmingham, the airport, railway station and Trinity Business Park.

The A45 east of M42 Junction 6, is dual carriageway trunk road, with service roads running parallel between Junction 6 and Stonebridge Island. Eastway provides access to NEC, Middle Bickenhill and a haulage business north of the A45. Access to a waste disposal site, several small businesses and a quarry is provided via the service road to the south of the A45.

To the north-east of Junction 6, the area is predominantly green belt with arable farming and mineral extraction. The High Speed Rail (London – West Midlands) Act 2017 indicates that a new station – Birmingham Interchange – will be built north-east of the junction, with major alterations to the adjacent road network. This includes alterations to the A452, A45 and Junction 6 itself. In addition, there is a significant housing / commercial development in this area proposed by UKC. SMBC's local plan is currently being updated and this area would be removed from the green belt as part of this update.

To the south-east of Junction 6, beyond the NMM lies the village of Hampton-in-Arden and large areas of green belt. There are a number of businesses to the south of the A45 and all have access to Junction 6 via a service road that runs parallel with the A45.

To the south-west of Junction 6 the area is predominantly green belt with the local communities of Bickenhill and, further south, Catherine-de-Barnes connected by the B4438. This area also includes a section of the Birmingham-Euston railway which runs in a north-west to south-east direction in close proximity to Junction 6.

A controlled motorway system operates along a section of the M42, between Junction 9 and a point approximately 2 miles east of Junction 3. Dynamic Hard Shoulder (DHS) running with emergency refuge areas is currently in operation between Junctions 3A and 7 (constructed as the pilot controlled motorway project in 2006).

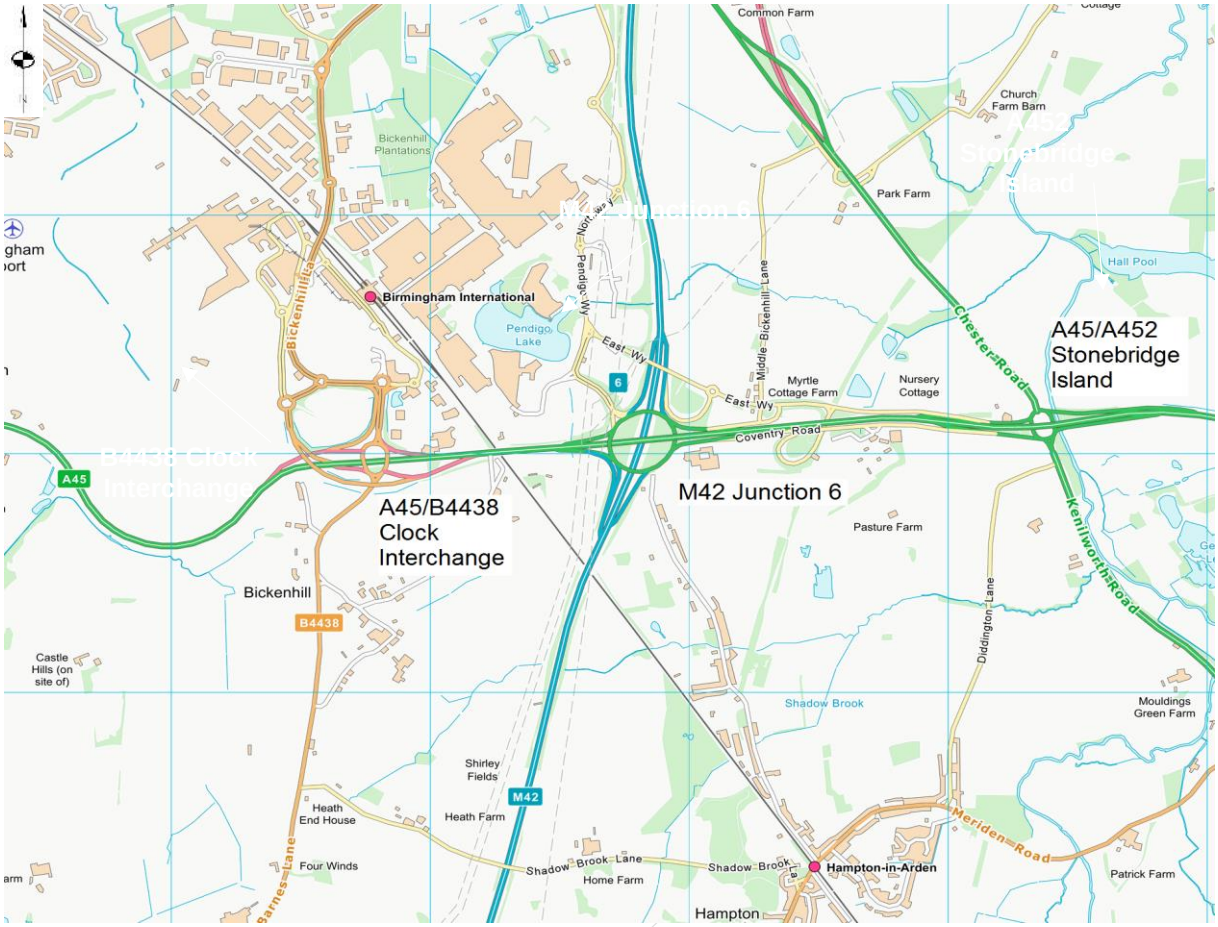


Figure 2.2 – View of M42 Junction 6 and A45 © Ordnance Survey

The A45 is a combination of rural and urban all-purpose road which connects Birmingham to the A14 trunk road in the East Midlands. The A45, in the vicinity of M42 Junction 6, lies between Clock Interchange (B4438) and A452 Stonebridge Island (highlighted in Figure 2.2). The A45 from the M42 Junction 6 to A452 Stonebridge Island is part of the SRN, and the A45 to the west of Junction 6 is the responsibility of SMBC.

It should be noted that a section of the A45 on the westbound carriageway between M42 Junction 6 and Clock Interchange was recently widened (August 2016). This was part of a local network improvement scheme which provided a non-physical segregated lane to Birmingham Airport, Birmingham International Railway Station and the B4438 for vehicles travelling on the M42 northbound leaving at Junction 6, and with a lane drop arrangement on the A45 westbound.

2.2 Existing Highway Network

2.2.1 Highway Cross Section

The existing highway cross section of the M42 between Junction 5 and Junction 7 was originally built as a dual 3-lane motorway (D3M as per TD 27/05 [Ref 1]). This section of the M42 was changed to a controlled motorway in November 2006 and the lane widths were modified. Within the controlled motorway cross-section, through-junction running (TJR) is not provided at Junction 6 as the route is constrained by

hard-shoulder widths and the proximity of structural abutments at Junction 6. Some modifications would be required if the hard shoulder was to be used as a running lane. TJR is not within the scope of this improvement project.

The A45 between the M42 and Clock Interchange (junction with the B4438) is an urban road and the cross section is similar to an urban three lane all-purpose dual carriageway (D3UAP) in the UK DMRB TD 27/05. The recent highway improvement scheme along the westbound section of the A45 changed the cross-section by extending the merge from the M42 free-flow link into an additional non-physical segregated lane westbound. A replacement bridge over the Birmingham-Euston railway was also included within the improvements - this is a non-standard layout.

The A45 between Junction 6 and the A45/A452 Stonebridge Island junction is a rural road with a cross section similar to a rural all-purpose three-lane dual carriageway (D3AP) in UK DMRB TD 27/05. This section of road is within the SRN. Running parallel with the A45 on either side are service roads which run between the slip roads at Junction 6 and Stonebridge Island and provide access to local businesses and Middle Bickenhill.

2.3 Existing Bridge Structures

Basic details of the bridge structures are summarised in Table 2-1 below. The existing structure locations are shown on drawing HE551485-MOU-GEN-M42_J6-SK-CB-0001 in Appendix C.

Generally, all the structures are in FAIR to GOOD condition. Minor defects have been reported in the inspection reports which include map cracking, shrinkage cracking and appearance of water staining. Maintenance works have recently been carried out and confirmed in the latest general and principal inspection reports. However, the condition of the structures along with potential constraints and load carrying capacity should be investigated and assessed in more detail once the preferred option is selected.

Bridge Name (Structure Key)	No of Spans	Structure Span	Structure Width
Solihull Road (4909)	2	17.8m skew span	14.6m
Bickenhill Lane (3588)	2	18.55m	12.68m
Shirley Fields Accommodation (4910)	3	36.1m Centre Span 15.5m Side Spans	5.4m
Hampton Railway (13096)	2	15.61m & 13.06m	51m
M42 Interchange South (3590)	2	39.5m overall span	15.1m
A45 Interchange Central (3591)	2	42m overall span	TBC
M42 Interchange North (3592)	2	39.5m overall span	15.1m
NEC Access (3593)	3	42.5m Centre Span 30m Side Spans	12.2m
The Inbound Access A45 Overbridge (50229)	3	91.1m overall span	14m
Outbound Access A45 Overbridge	1	24m overall span	13m
Clock Interchange West Overbridge (50109)	2	29m overall span	14.9m
Clock Interchange East Overbridge	2	29m overall span	14.9m

Bridge Name (Structure Key)	No of Spans	Structure Span	Structure Width
(50111)			
The Inbound Access Catherine De Barnes Overbridge (50228)	1	29m overall span	13.23m
A45 South Bridge (Replaced Structure)	1	22.7m clear span	28.2m
M42 I/C East (12977)	1	14.6m span	24.17m
M42 I/C West (12978)	2	28m overall span	16.17m

Table 2-1: List of existing bridge structures within the general scheme limits

There are a number of culverts, retaining walls and gantries within the scheme limits. Details of these structures can be found in the TAR.

2.4 Junctions

2.4.1 M42 Junction 6

The existing M42 Junction 6 is a grade-separated junction between two major roads - the M42 motorway and A45 Trunk Road (non-trunk to the west of Junction 6). A signalised roundabout forms part of the junction, which facilitates all movements between the two routes. Traffic signals are located at each of the four main approaches and at the access to the NEC. There are also ramp meter signals on the M42 northbound and southbound entry slip roads.

The signalised roundabout also provides access to two major stakeholders: the NMM and the NEC both have access and egress points directly onto the circulatory carriageway. The NEC access is signal controlled, whilst the NMM access is uncontrolled. M42 Junction 6 currently links to Birmingham Airport and Birmingham International Railway Station via the A45 westbound including a dedicated free-flow link from the M42 northbound exit slip road - which leads into a segregated lane on the A45 westbound carriageway. Widening of the A45 westbound was carried out in 2016 by SMBC. Figure 2.3 below provides an aerial image of the junction.

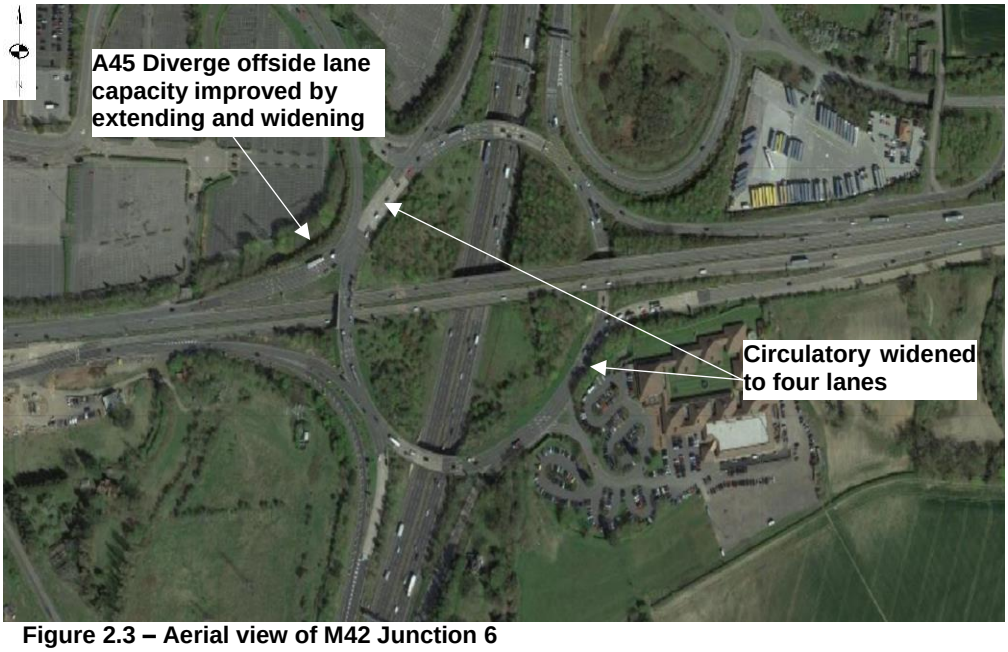


Figure 2.3 – Aerial view of M42 Junction 6

A PinchPoint Programme (PPP) scheme was completed in December 2014. The PPP scheme widened the circulatory carriageway to four lanes opposite the NMM and over the western bridge between the A45 westbound entry and A45 eastbound exit slip roads. The A45 eastbound slip road to Junction 6 was widened on the offside to increase right turn capacity. This was done to provide some initial relief to congestion problems. Additional resurfacing works completed in March 2015, and included areas of new high friction surfacing, safety barriers and parapets, signs, lines and traffic signals. A footpath is located on the eastern and southern side of Junction 6. It links the footpath/cycleway on the westbound side of the A45 on the west side of Junction 6 to the A45 east of Junction 6 on the eastbound side of the carriageway. This footpath can be used to link the local communities of Bickenhill and Hampton-in-Arden and can also be used by pedestrians using the local bus service.

2.4.2 Clock Interchange

Clock Interchange is situated on the A45 towards Birmingham and is a junction with the B4438. As well as access to Bickenhill Lane to the north and to the communities of Bickenhill and Catherine-de-Barnes to the south, this junction also serves traffic using Birmingham Airport, Birmingham International Railway Station and the local business park. There is a separate flyover link from the A45 westbound exit slip road onto Airport Way. This junction can be heavily trafficked, particularly at PM peak times and when there are large numbers of passengers using the airport and railway station.

2.4.3 Stonebridge Island

Stonebridge Island is the junction between the A45 Coventry and the A452 Chester Road/Kenilworth Road. On the western side of Stonebridge Island the westbound (onslip) slip road splits into a merge onto the A45 and also forms the beginning of a service road running parallel with the A45 before merging back onto the A45 (off slip) approaching Junction 6. There is a similar link from the M42 Junction 6, with a diverge off the A45 eastbound on-slip which runs parallel with the A45 to merge onto the A45 off-slip, on the approach to Stonebridge Island.

2.5 Traffic

The London to Scotland West Route Strategy Evidence Report April 2014 and Technical Annex April 2014 provides a ranking for the Annual Average Daily Flow (AADF) of traffic for each designated link road of which there are 2475 in total. The majority of the M42 links are within the top 120 of this total, some examples are given below:

1. M42 between M42 J7 and M42 J6, AADF = 67,079, Ranking = 86/2475
2. M42 between M42 J6 and M42 J5, AADF = 65,796, Ranking = 99/2475
3. M42 between M42 J6 and M42 J7, AADF = 65,057, Ranking = 105/2475
4. M42 between M42 J5 and M42 J6, AADF = 64,694, Ranking = 109/2475

The report also provides a number of headline figures which are listed below:

- M42 experiences peak hour speeds of 41 to 50mph on this 70mph motorway (note Active Traffic Management (ATM) peak speeds are defined as 60mph)
- M42 in the top 10% for vehicle-hour delay

The traffic figures show that the M42 is running close to capacity and may require future widening and/or conversion of the DHS running to All Lanes Running (ALR) in the near future should traffic growth levels continue to rise. (Traffic Flow schematics are shown in Appendix H)

The M42 forms the south and eastern arms of the Birmingham Box. On the eastern arm around M42 Junction 6, the M42 carries around 130,000 vehicles a day. The A45 is a major arterial route for Birmingham, linking it with Coventry and carries around 70,000 vehicles a day with some 50,000 turning movements a day at Junction 6.

Following the implementation of the PPP scheme to improve capacity at Junction 6, the junction frequently operates within capacity and is anticipated to continue to do so until 2019 when capacity is expected to be reached resulting in a high degree of saturation. However, when there are motorway incidents, major events at the NEC or severe weather conditions, the capacity is exceeded leading to significant congestion. Some emergency plans are in place to deal with the severe congestion events however the increased levels of traffic and anticipated growth of the local developments will lead to increased congestion unless improvements are made to the junction.

Due to the proximity to the NEC, Birmingham Airport and Birmingham International Railway Station, significant congestion can also occur during the morning and evening peak periods. The NEC and Highways England have identified major events held at the NEC which have the potential to contribute to a high or medium impact on the network and have the potential for severe or moderate delays to the SRN. These events can occur up to 1 in 6 days per year in particular during AM and PM peak times. This is due to the substantial increased levels of traffic that are attracted to these events. In order to mitigate the potential impact, intervention measures have been identified and are implemented as required.

In addition, there can be incidents on the A45 and the SRN on the M42, M6 or M40 that have the potential to impact upon the operation of M42 Junction 6 - depending on the severity of the incident e.g. major traffic accidents, breakdowns, statutory undertaker works/repairs, technology faults, etc. Therefore, the number of days per year in which the junction operates within capacity is significantly affected and Junction 6 needs improvement in order to provide better journey time reliability.

Ramp metering is in place on the northbound and southbound entry slip roads at Junction 6 and operates on a regular basis. However, there are also frequent occasions when the ‘Queue Over-ride’ function is triggered on the ramps to an extent where the signals cannot operate as they were intended. This can lead to traffic backing up onto the Junction 6 circulatory and can contribute to the frequent congestion issues experienced at the junction.

2.6 Topography, Land Use, Property and Industry

The M42 within the area of interest/study area is in a mixture of cutting and embankment. Land adjacent to M42 has varying topography but not considered undulating and the majority of the area is fairly flat.

Although the area around M42 Junction 6 is generally rural in nature there is a mixture of land-use that results in a set of constraints which have a significant impact on future improvements to the M42 Junction 6.

A large section of land to the immediate west of the M42 and north of the A45 is taken up by the NEC. The NEC holds major events throughout the year attracting six million visitors and a further major attraction – Resorts World has recently opened and is expected to reach around three million visitors in its first year. The main access to the NEC is via M42 Junction 6 but other accesses are available on the north side of the development onto the B4438 Bickenhill Lane and also on the east side on East Way. Beyond the NEC lies the residential area of Marston Green within Solihull Metropolitan Borough with Birmingham Business Park further north. Further west along the A45, Birmingham Airport attracted around 10-11million passengers during 2016 with a projected rise of up to 19 million passengers by 2020. With Birmingham International Railway Station and further local businesses located around the airport and NEC, the land-use and local road network will come under increasing pressure with expected growth in the area. This results in additional demand for an improved SRN.

On the north-eastern side of Junction 6 there is significant development planned by SMBC. The UKC development promoted by the UGC is planned for the triangular section of land between the M42, A45 and A452 with a mixture of residential and commercial development. This area will also include HS2 Birmingham Interchange station which is due to open in 2026 and could provide up to 3,500 new jobs. There is access to Middle Bickenhill and a haulage firm from the slip road adjacent to the A45.

South of Junction 6 and the A45 is predominantly a rural area but includes local communities of Hampton-in-Arden, Bickenhill and Catherine-de-Barnes within green belt land. There are a number of small businesses located on the south side of the A45 east of Junction 6 which are served by a connecting road that runs parallel to the A45. The NMM, which hosts an increasing number of events each year, is located immediately to the south-east of the junction with access onto the circulatory carriageway. Access into and out of the NMM is direct from the roundabout without any traffic signal control. Potential alternative arrangements for exiting the NMM were investigated during Stage 2 of the project but no permanent alternative exit has yet been agreed. Further east of the junction, the proposed route of the HS2 alignment will pass underneath the A45 at the mid-point between Junction 6 and Stonebridge Island.

Farmland dominates the area around the villages of Bickenhill and Catherine-de-Barnes to the south-west of Junction 6. Other features in this area include a number of sports fields owned by the GAA, the recently built Birmingham Dogs Home and Bickenhill Meadows SSSI (Site of Special Scientific Interest). The Birmingham-

Euston railway runs in a north-west/south-east direction close to Junction 6 and any impact on this track could have significant construction implications for the scheme due to the severely restrictive railway possessions. A number of public utilities are located to the south-west of Junction 6 and include high voltage overhead electricity pylons (also run parallel to the east of the M42), high-pressure gas mains, a water aqueduct and an oil pipeline which serves Birmingham Airport. All of these services would involve significant costs and require careful programme planning if impacted by any of the improvement works to Junction 6. Further west towards north Solihull, is the Lode Lane JLR plant which currently employs a workforce of 5,000 but has plans for expansion in the near future.

A further potential constraint on the south side of the junction are proposals for a new MSA. This is planned to be located about 2.4km south of Junction 6 and will require a new junction to the services. This application was submitted to SMBC in 2015 and is still under consideration. If approved, the proposed junction and access to the services would have a direct impact on any improvements planned to the M42 mainline south of Junction 6.

2.7 Drainage

2.7.1 Overview and Baseline Conditions

The area in the vicinity of M42 Junction 6 is situated adjacent to two tributaries of the River Blythe (Hollywell Brook and Shadow Brook) and other smaller watercourses. Shadow Brook and Hollywell Brook flow eastwards where they converge with the River Blythe, approximately 2km east of the M42.

According to the British Geological Survey (BGS) borehole registers, groundwater is present across the whole site and is generally found within 10m of the ground surface. Secondary A aquifers (minor aquifers) are present on site. There are no groundwater source protection zones present on site.

The habitat around the site is classified as “seasonally wet pastures and woodlands” and the land cover is described as “grassland and arable woodland”. Both parameters give an indication of the actual and potential vegetation of the area and the overall use of the land. The Environment Agency (EA) states that the quality of the water the tributaries is a General Quality Assessment (GQA) Grade B, indicating the chemical and biological condition of the river is good.

The BGS Surface Geology Bedrock Map indicates that the main type of soil type which underlies much of the site is Mercia Mudstone clay. This is likely to have low permeability and be unsuitable for drainage infiltration techniques.

The site is situated adjacent to some of the River Blyth tributaries and other smaller watercourses. Those tributaries and watercourses around the River Blythe present some severe flooding issues.

An approximate 100m section of the carriageway where Hollywell Brook passes beneath the M42 is in Flood Zone 3 which means land is assessed as having a 1 in

100 or greater annual probability of river flooding (>1%). The areas immediately adjacent to Shadow Brook to the east of the M42 are designated Flood Zone 3.

Further afield of the M42 corridor, the land is designated as Flood Zone 2 which corresponds to a 1 in 1000 year risk of flooding from rivers (>0.1%). The M42 carriageway comprises pockets of localised low lying areas designated as having a "low risk of flooding" which corresponds to a 1 in 1000 year risk of flooding from surface water (> 0.1%). The site is considered to have a low susceptibility to groundwater flooding (< 25%).

Where there are existing culverts within a length of the scheme to be upgraded, their capacity will need to be checked. This is particularly important if flooding upstream is a known problem - as it is in Hollywell Brook culvert beneath the M42. It is possible that there may have been changes to the upstream catchment since the culvert was built, resulting in potential issues with capacity of the culvert. The proposed free-flow link outside the NEC (A45 eastbound to M42 northbound) where the new road passes under the existing access, results in a low level underpass. Potentially a flood compensation areas will be needed in order to mitigate the impact that the road improvements could have.

2.7.2 Road Drainage and the Water Environment

The options taken forward from public consultation are located south of the A45 and to the west of the M42. All three options drain into two different types of outfalls: existing surface water courses in the southern section of the new link road; Shadow Brook, located north of the Solihull Road B4102 Bridge; and for the northern section of the new link road an existing surface water sewer located at the airport flyover structure over Catherine-de-Barnes Lane at Clock Interchange. Infiltration into the ground has been assessed but the site is largely clay and likely to have low permeability and will be unsuitable for drainage infiltration techniques.

Although infiltration is not feasible, other SUDS (Sustainable Drainage Systems) features such as vegetated detention basins, sedimentation ponds, detention ponds or a hybrid system combination of them can be designed to attenuate run-off and provide an acceptable water treatment according to the loading of the runoff pollution. The use of vortex separators along the new link road could be used to catch sediment and substantially reduce drainage maintenance activities. Due to the vicinity of Birmingham Airport all ponds and detention basins will need to be agreed with the airport during the preliminary design stage.

All three options will intercept existing catchment areas that drain to the stream network. Existing land drainage would need to be kept separate from the road drainage. Inevitably, some land drainage flow patterns will change – this will need to be reviewed during preliminary design.

The proposed southern junction in Options 1 and 2 and the proposed connector links in Option 3 would require a new culvert for Shadow Brook. All culverts are longer than 12m, so they are to be considered as structures and their diameter should be to a minimum of 1.2m to facilitate access for maintenance. At the inlets and at the

outfalls, headwalls will be provided and the bed and banks from Shadow Brook will be protected from scour to prevent erosion.

2.8 Non-Motorised Users Routes

No formal Non-Motorised Users (NMU) audit (as HD42/05) has yet been carried out as part of the M42 Junction 6 Improvement scheme. The design team has assessed available information from SUSTRANS, the NMU context report prepared as part of the proposed MSA planning submission and Public Rights of Way (PRoW) information in the area (as shown in Non-Motorised Users Plan-Drawing No HE551485-MOU-ENM-M42 J6-SK-D-0001 in Appendix D).

However, early consultation with SMBC representatives has highlighted a number of NMU issues and opportunities for works required around Clock Interchange (refer to drawing no HE551485-MOU-GEN-M42_J6-SK-CH-0118 in Appendix D). Option 1 will impact significantly on the existing shared footpath/cycleway along Catherine de Barnes Lane. The footpath/cycleway here is a key part of both SMBC's and the national cycling networks. The outline design concluded two possible design solutions to provide:-

i. a new footpath/cycleway along the realigned Catherine de Barnes Lane;
ii. an offline footpath cycleway to the west of the proposed dual carriageway earthworks.

Without up-to-date NMU survey data it is not possible to establish the full extents of the improvements to M42 Junction 6 on the existing NMU network in the surrounding area. The details of NMU provision would need to be developed in conjunction with upcoming developments - HS2 terminal, NEC Masterplan and UKC development.

Based on the available information, a Stage 1 NMU Audit will need to be carried out on the preliminary design to highlight any issues that can be either be addressed before planning or 'designed out' at detailed design – as now described in HD 42/17 (Walking, Cycling & Horse-Riding Assessment and Review). Further NMU audits will be required at detailed design and completion of construction.

3 Planning brief

3.1 Introduction

M42 Junction 6 is a crucial junction on the SRN, at the heart of an area of dynamic growth, surrounded by a unique mix of major assets that serve both the local and wider community. It provides the link between the M42 and the A45 Coventry Road which serves a number of key strategic economic assets that are currently expanding including: Birmingham Airport, the NEC, JLR, NMM, Birmingham International Railway Station and Birmingham Business Park.

The M42 Junction 6 will also be used by additional traffic generated by the planned HS2 Birmingham Interchange station and the proposed UKC development to the immediate north-east of the junction being promoted by SMBC. There is also a planning proposal for a new MSA on the M42 which would have an impact on the new southern junction, if it obtains planning approval.

Current congestion and journey reliability issues at Junction 6 are constraining investment and economic growth. Without infrastructure investment to improve the junction a major investment opportunity of national significance could be lost. The M42 Junction 6 Improvement scheme will be developed taking into account an overall programme of works planned for the area by a number of 3rd party organisations (HS2, SMBC, NEC, Birmingham Airport, etc.). This will allow the expected benefits of each scheme by these organisations to be maximised; and to address the significant congestion issues and constraints in the area.

The effect of the current levels of congestion, tied to the known increasing developments in the area, provide a compelling need for the improvement to this junction.

The brief for the scheme as set out in DfT's Road Investment Strategy (RIS) 2015-20 is to provide a "…*comprehensive upgrade of the M42 Junction 6 near Birmingham Airport, allowing better movement of traffic on and off the A45, supporting access to the airport and preparing capacity for the new HS2 station*."

In addition, there are a number of long term developments proposed to maximise the potential from HS2 which will further increase the amount of vehicles using this junction. Although the proposed junction options do not specifically support these developments, the chosen option must not preclude or prevent their promotion by third parties.

3.2 Scheme Objectives

Following the publication of the RIS document, the Client Scheme Requirements (CSR) subsequently defined the main transport objectives of the scheme (also stated in the Strategic Outline Business Case) as follows (see Table 3.1)

Objective	How it aligns with strategic aims	Measures for success of objective
Objective 1: Increase capacity	• support and facilitates economic growth through providing adequate capacity on the network	• improved journey time reliability and reduced congestion at Junction 6 and on the M42 adjacent to it • annual monitoring reports
Objective 2: Provide access to key assets	• supports and facilitates economic growth • balances the needs of individuals and businesses who rely on it.	• journey time reliability to B'ham Airport, NEC and HS2 not compromised.
Objective 3: Promote reliable and safe operation of the wider corridor	• supports and facilitates economic growth • balances the needs of individuals and businesses who rely on it.	• average speed and reliability of journey on the M42 adjacent to Junction 6
Objective 4: Increase resilience and reliability of network	• supports and facilitates economic growth • is maintained to a safe and serviceable condition	• reduction in the number of incidents • assessment of how the network copes with incidents at the junction and on the surrounding network.
Objective 5: Unlock the potential for economic growth in the area	• supports the development and implementation of the long-term Midlands Transport Strategy	• scheme continues to work, following approval of new corporate, commercial and/or residential developments • continued investment in the local economy by existing stakeholders

Table 3.1 Summary of Transport Objectives

It should be noted that although the objectives include a measure of safety and number of incidents, the level and severity of accidents at M42 Junction 6 is generally lower than the national average. However, by removing some of the traffic from the existing Junction 6 and the provision of free-flow links with improved merge/diverge arrangements, an improvement in safety of the area is expected.

3.3 Client Scheme Requirements

The CSR sets out the requirements for the project, covering a high-level definition of the transport challenges and issues, objectives, project outputs and costs.

In response to direct questions from the Secretary of State, the Highways Agency (now Highways England) commissioned the UK Central Study 1 Report: Identifying the need for Intervention & Developing Options (August 2014). This study assessed the current and forecast conditions with and without the inclusion of the proposed UKC development; and identified Junction 6 as a current and future congestion hot spot. The study promoted an initial solution that would promote future growth and

maintain the safe operation of the SRN. This was then promoted to the DfT, for inclusion in the RIS as part of the 2014 Autumn Statement.

3.4 Planning Issues

The principle known planning issues at this stage of the scheme's development that impacted on the route options choice are:

- Which option has least impact on the openness of the green belt, balanced against potential harm to other material planning considerations and fulfilling the objectives of the road scheme;
- Which option has minimal impact on the Bickenhill SSSI, balanced against potential harm to other material planning considerations and fulfilling the objectives of the road scheme;
- Which option has minimal impact on the rural character of the area;
- Which option will impact least in terms of noise and air pollution;
- The potential impact on the GAA facility and, if required, can a suitable alternative location be found.

Variants on the alignment were considered in relation to the impact on the GAA facility and discussions with the GAA are ongoing in order to achieve a balance in providing an alignment that has both a minimal impact on the SSSI and is an agreed solution with the GAA. (See Chapters 5 and 10 for more details on discussions with the GAA).

3.5 Purpose of the Green Belt

As defined in the National Planning Policy Framework (NPPF) Guidance produced by the Government, green belt serves five purposes:

> *"to check the unrestricted sprawl of large built-up areas;*
> *to prevent neighbouring towns merging into one another;*
> *to assist in safeguarding the countryside from encroachment;*
> *to preserve the setting and special character of historic towns; and*
> *to assist in urban regeneration, by encouraging the recycling of derelict and other urban land."*

Green belts are not landscape designations and can contain poor quality brownfield land. There is no grading system to green belt as its purpose is to maintain the openness of the landscape not its visual quality.

To achieve these aims the openness of the green belt has to be protected from what is defined as inappropriate development, unless very special circumstances to justify the impact can be established. Inappropriate development is development that impacts on the openness of the green belt.

Engineering operations, such as road construction, can be considered as appropriate development so long as they do not impact on the openness of the green belt and act as through routes, i.e. do not encourage further development in the green belt.

The proposed junction options fall into this category and therefore will have to demonstrate very special circumstances before they can be allowed to utilise the green belt, such as the traffic justification for the road, the lack of options outside the green belt and associated socio-economic benefits will have to be demonstrated.

However, in order to mitigate any impact to the openness of the green belt, the preferred option alignment is predominantly in deep cutting and has limited connections to the local road network. Alternative schemes outside the green belt were initially investigated within the Options Development phase of the project but were assessed as not suitable for a variety of reasons and could not be justified taking forward (details of these alternatives can be found within the TAR).

4 Summary of Do Nothing Consequence

4.1 Current Conditions

M42 Junction 6 is one of the busiest interchanges in the country providing a link between the M42 Motorway and A45 Coventry Road. Previous studies have identified persistent problems at the junction as follows:

- At Junction 6, the M42 and A45 carry some 130,000 vehicles/day and 70,000 vehicles/day respectively with some 50,000 turning movements and 7000-7500 vehicles at peak hours, operating at near capacity;
- Local stakeholders can increase traffic levels substantially due to increased passengers at the airport, more commuting journeys using the railway station and major events at the NEC combined with an increasing number of events at the NMM and visitors to Resort World. This has led to regular 'lock-ups' at the junction in recent years which can take several hours to clear;
- There is substantial growth planned both with the existing assets – airport, JLR, NEC (Resorts World), HS2 Birmingham Interchange and with aspirational planned growth of the UKC development – leading to a further strain on the road network;
- A PinchPoint scheme carried out in late 2014/early 2015. However, these improvements were due to provide temporary relief to queue lengths until 2019;
- The location of M42 Junction 6 is heavily constrained to the north by the proximity of M42 J7 (with M6 J4), to the west by A45 Clock Interchange (to airport), and to the east by the A452 Junction, all in close proximity. The roundabout itself is also constrained by having accesses on the circulatory to the NEC and NMM.

M42 Junction 6 has been noted as currently operating at near capacity with some 7000 to 7500 vehicles using the junction during a typical peak hour. On event days at the NEC, additional daily event based demand of some 1500 to 2000 vehicles with typically 500 additional vehicles during the peak hours, contributes to significant congestion. This in turn affects both the M42 mainline and the local road network impacting on journey times, resilience and safety. From surveys undertaken during a major event at the NEC, traffic queues up to 1km were observed on the approaches to Junction 6.

Significant development has been earmarked for the area including UKC with growth around the NEC, Birmingham Airport and the proposed HS2 Station. As part of the PPP scheme, modelling by Highways England's Maintaining Agent Contractor (MAC) in Area 9 (Amey, 2012) showed that even without further development, the current geometric layout of Junction 6 is forecast to be above its capacity by 2019 with consequent increased congestion and delays. It is considered that without a suitable upgrade of the existing junction, there is likely to be significant impact on the

proposed development as well as local, regional and even national economy, connectivity and accessibility.

The scale of the development proposals near the M42 Junction 6 will result in changes in traffic patterns relating to trip volumes and distribution, mode share and trip timing with the key benefit of the scheme expected to be on the SRN.

4.2 Level of Service

In order to assess the likely operation of M42 Junction 6 in the future should no improvements to the junction be undertaken, the anticipated level of service has been extracted from the Local Area Model (LAM).

Figures 4.1 and 4.2 show the anticipated level of service and associated queue lengths for two future years, 2026 and 2041. In both cases the LAM has been run with the matrices for Do-Something demand, on the existing network, showing a decreasing level of service as demand rises over time. Table 4.1 below gives the definitions to level of service indicated in Figures 4-1 and 4-2. In 2026 the approaches to Junction 6 are forecast to be operating with levels of service between levels B and C (with mean delays up to 25 seconds). By 2041 the levels of service are forecast to deteriorate to levels C to E with mean delays now up to 50 seconds.

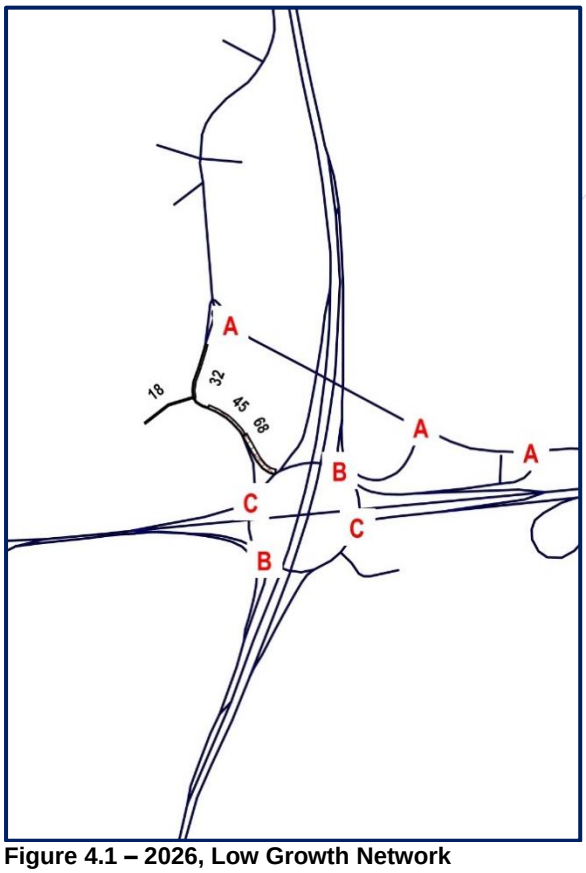


Figure 4.1 – 2026, Low Growth Network (Do Something Demand) – PM Peak

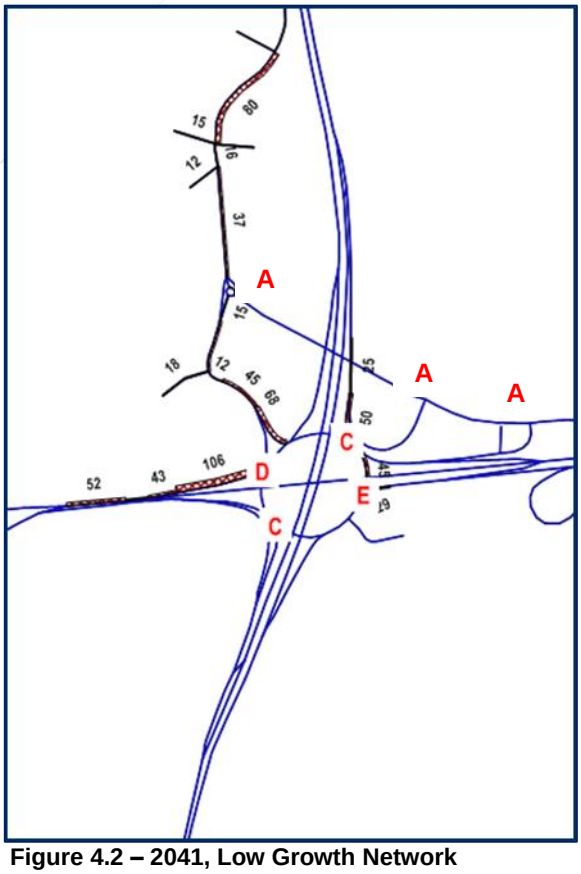


Figure 4.2 – 2041, Low Growth Network (Do Something Demand) – PM Peak

Table 4.1 below gives the definitions to level of service indicated in Figures 4-1 and 4-2 above.

Level of Service	Mean delay/vehicle (seconds)
A	0 – 10s
B	10 – 15s
C	15 – 25s
D	25 – 35s
E	35 – 50s
F	50+s

Table 4-1: Level of service

4.3 HS2 Enabling Works

The HS2 Birmingham Interchange station is located on a triangle of land adjacent to the north-eastern quadrant of M42 Junction 6. The site is bounded by the M42 to the north of Junction 6, A45 Coventry Road and A452 Chester Road.

Analysis predicts that 21,000 passengers per day will use Birmingham Interchange when it opens in 2026. The HS2 enabling works are programmed to commence in 2018 in order to meet the opening date. The enabling works will significantly alter the highway network in the vicinity of M42 Junction 6.

Figure 4-3 below shows the current plans for the HS2 enabling works. This network configuration has been included in the Do Nothing traffic model.

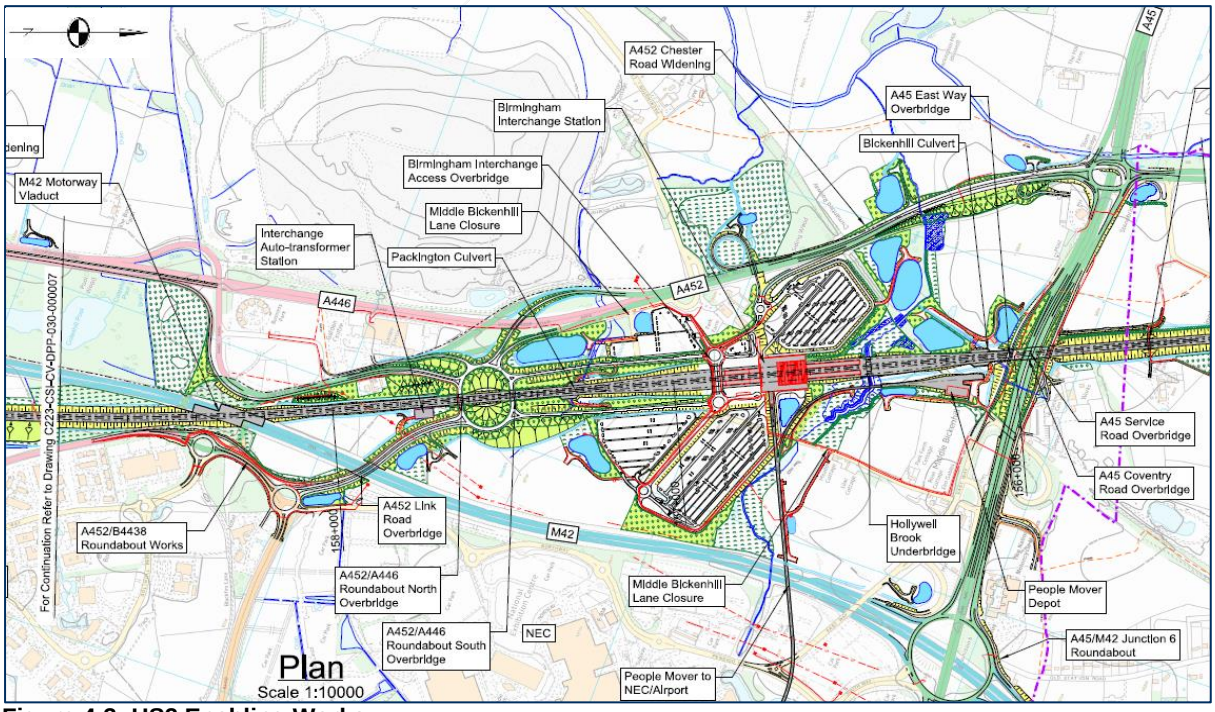


Figure 4-3: HS2 Enabling Works

4.4 Proposed Developments

In addition to the HS2 development, there are aspirational plans by UKC in the area that involve significant changes to the local road network, including additional structures over the M42, just north of Junction 6. There are no confirmed dates for this development, but the Junction 6 improvement scheme will need to interact with these works.

It is proposed that the M42 Junction 6 Improvement works are completed prior to HS2 opening to the public, and prior to the use of the planned UKC development.

A new MSA is proposed between Junctions 5 and 6 of the M42. A planning application was submitted to SMBC in July 2015 and a final decision is still to be made.

Birmingham Airport have planning permission to increase their airport capacity to handle 27 million passengers per year by 2030 and JLR have aspirational plans for expansion that may require improvements to the local road network.

4.5 M42 Corridor Capacity

An analysis of the link capacity of the M42 from Junction 7a in the north to Junction 4 in the south has been undertaken based on the 'critical flow' calculation described in the Cost Benefits Analysis (COBA) Manual within the Design Manual for Roads and Bridges (DMRB).

The formula uses a combination of default values and the observed percentage of heavy goods vehicles (PHV) in order to produce a likely critical flow factor related to the speeds on links. This factor indicates at which point congestion is likely to occur on any given link in relation to the link's capacity. The COBA formula is based on the concept of a maximum realistic value of flow of 2330 vehicles per lane per hour. This maximum value is then reduced proportionately as the percentage of heavy goods vehicles in the flow increases. During the inter-peak period when the proportion of HGVs is highest – nearing 20% of the flow on the M42 – the resulting capacity reduces to a value nearer 1800 vehicles per lane per hour which coincides with the guideline figure used for the purposes of highway design (TD 22/06).

For the initial capacity assessment, traffic volumes were taken from the surveys undertaken for the Junction 6 improvement study. The manual classified traffic counts undertaken in February 2016 (during school term time) have been used to provide the estimates of flow. These traffic flows have then been compared to the calculated capacities in the form of volume/capacity ratios to provide an indication of the presence of congestion. A value of volume to capacity (v/c) of 0.85 is generally taken as the threshold above which a link is deemed to be experiencing congestion. The v/c ratios are generally below the threshold level of 0.85. Drawings showing the 2016 flows are included in Appendix H.

Perhaps of more significance is that capacity assessments based on link flows alone do not take account of the effects of merge, diverge and weaving movements whose

combined effects will significantly reduce capacity particularly with relatively short distances between successive junctions.

Paragraph 2.71 in DMRB Volume 6 Section 2 Part 1 TD 22/06 gives a formula for the number of traffic lanes required for weaving. Traffic modellers have used this relationship to derive an estimate for the reduction in capacity that arises from weaving within an existing carriageway provision, essentially by inverting the TD22/06 formula. On this basis it has been estimated that weaving will typically reduce the capacity by up to a quarter. Taking the value of 2330 vehicles per hour per lane as representing the maximum realistic link capacity, then under weaving conditions, the capacity could be reduced to some 1725 vehicles per hour per lane. On this basis it seems reasonable to adopt a figure of 1800 vehicles per hour per lane (as per TD 22/06) as an estimate of practical capacity. The assessment shows that, in contrast to the realistic maximum capacity assessment, the majority of links exceed the threshold for most of the day, particularly in the northbound direction.

However, an assessment of link capacity under current flow conditions during February does not provide the complete picture. First, it is necessary to take account of seasonality over the year. Second, traffic flows on the M42 are significantly affected by events, particularly associated with major exhibitions at the NEC. Finally, following the recent recession, a resumption in the growth in traffic flows is now forecast.

Table 4.2 below shows the seasonality profile index across the year for the M42. It can be seen that February flows are slightly below the neutral March average (index 100) and that flows are generally some 4-6% higher than February across the summer months.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
M42	92	98	100	102	103	102	102	102	104	103	101	91

Table 4-2: M42 Seasonality Profile Index

A study was undertaken in 2012 for the PPP scheme at M42 Junction 6. Manual classified counts were undertaken at Junction 6 over a 12 hour day in two consecutive weeks. The first day (2nd February) was representative of 'normal' traffic conditions. The second day (9th February) included traffic associated with the annual 'Spring Fair' at the NEC. Traffic flows at Junction 6 during the Spring Fair were recorded as being 28% higher than the previous week, with traffic from M42 Junction 6 to the M42 northbound being 7% higher and to the south 18.5% higher. It is anticipated that similar traffic conditions will occur during other annual major events at the NEC (Autumn Fair, Crufts, Gardeners' World, etc.).

The National Road Traffic Forecasts for motorways in the West Midlands suggests that traffic flows will increase by some 20% between 2015 and 2030.

The analysis of traffic volumes and speeds on the section of the M42 between Junctions 4 and 7 has highlighted a number of issues associated with the current operation of this section of the motorway. The majority of links exceed their theoretical practical capacity of 1800 vehicles per hour per lane during much of the

working day. The speed plots illustrate that the slowest speeds appear to be at the extremes of this section, i.e. around Junctions 4 and 7 respectively and that the effects of congestion can spread beyond the immediate seed point.

The annual analyses have shown that the issue of slow traffic speeds occurs all year. In respect of both aspects of the analysis, flows and speeds, conditions can be expected to be worse during major events at the NEC, or significant vehicle movements from Birmingham Airport and over time as further traffic growth materialises.

The expanding existing nationally important infrastructure and future developments at Junction 6 require improvement to the flow of traffic through this junction and also on and off the motorway at this key interchange in the short term. Further improvements to this section of the M42 may also be required in the medium to long term, as the effect of the developments becomes apparent.

The proposed scheme is required to improve flow from these developments to the motorway in the short to medium term and support future long term improvements, as required, if the aspirational developments in the area are realised.

5 Summary of Alternative Options

5.1 Introduction

Following option identification, the only viable solutions taken forward for further development to public consultation were all variants of the southern junction theme with an additional option of one or more free-flow links. This report summarises the three options that were taken to consultation and does not include those options that were discounted:

- Option 1 – Southern Junction 2km south of Junction 6 with a link road to the west of Bickenhill village which connects to the A45 at Clock Interchange.
- Option 2 – Southern Junction 2km south of Junction 6 with a link road to the east of Bickenhill village which connects to the A45 at Clock Interchange via an additional roundabout.
- Option 3 – Southern Junction 1km south of Junction 6 with northbound exit and southbound entry onto the M42 only and link road to the A45 at Clock Interchange via an additional roundabout.

A more detailed description of these options and variations that were developed as a result of public consultation feedback are provided in the following paragraphs. Drawings of each option are provided in Appendix A and technical notes and narratives are in Appendix F.

5.2 Option 1

Option 1 as shown on drawing HE551485-MOU-GEN-M42_J6-DR-CH-0004 comprises a new dumb-bell roundabout junction (southern junction) with the M42, north of Solihull Road bridge and a new 120kph (70mph) dual carriageway link towards Birmingham Airport and Clock Interchange on the A45 aligned to the west of Bickenhill. Access to Catherine-de-Barnes Lane and Bickenhill village is accommodated via two staggered slip roads onto the new link road. The new dumb-bell junction incorporates a western roundabout which is increased in size compared with the eastern roundabout to accommodate the higher level of traffic, and provide access for the potential MSA. South facing slip roads are designed as a ghost island merge/diverge layout. North facing slip roads are designed as a simple tapered merge/diverge layout but would only be required if the MSA gains planning permission.

5.2.1 Alignment – Southern Junction location and Slip Road Layouts

The location of the new southern junction has been based on the location of the existing M42 junctions – namely Junction 5 and Junction 6 – as well as the predicted traffic flows. This has resulted in the junction being located approximately 2km south of the existing Junction 6 and results in Departures from Standard (DfS) for weaving length between M42 Junction 5 and the new southern junction (1800m) and new southern junction to M42 Junction 6 (1100m).

However, as the MSA design has received a DfS approval in principle regarding the reduced weaving length between the new MSA junction and Junction 6, its location is considered acceptable. The main reason for the MSA departure approval is related to the low traffic movements associated with the MSA in comparison with a full mainline grade separate junction. If the MSA application does not get approval the traffic model indicates minimal use for the north facing slips to the southern junction, and consequently they would not need to be built as part of this scheme

The position of the slip road layouts - in particular the south facing slips - have been designed to reduce the impact to the ancient woodland (Aspbury's Copse). For example the earthworks have been steepened to a 1 in 1 slope, and consideration has been given to submitting a DfS for reduced visibility to further minimise impact. The new south facing slip roads would also require extensions to Solihull Road bridge, in order to allow them to be placed under the structure, with the appropriate forward visibility.

It should be noted that following stakeholder engagement with the MSA, if these services were to be constructed prior to the M42 Junction 6 Improvement scheme, the abutment locations for the Solihull Road bridge have been positioned to provide the desirable minimum stopping sight distance (295m), which gives the preliminary design the ability to agree a Departure from Standard, and if this wasn't acceptable still provide the desirable minimum stopping sight distance, however, this would result in a greater impact to the ancient woodland.

Based on the emerging traffic results for 2041, the south facing slip roads and the mainline are considered an under-provision, as they will require five lanes on the M42 upstream of the new southern junction and this is outwith the scope of this project.

5.2.2 Alignment – Southern Junction Roundabout Design

To accommodate the expected traffic flows on the new link (and potential new MSA connection), the western roundabout size has been developed to the maximum recommended size in TD 16/07 (100m inscribed circle diameter (ICD)). An ARCADY analysis was undertaken on the new southern junction both with and without an MSA.

The ARCADY analysis showed that when considering a new southern junction with an MSA, the western dumbbell entry from M42 northbound diverge and entry from the MSA are over the recommended ratio of flow to capacity (RFC = 0.85) by 0.97 and 1.76 respectively. This would result in the need to enlarge the roundabout size or other equivalent measures to increase capacity to the required level. Without an MSA, the RFC would be within the recommended ratio.

The ARCADY analyses will be re-run during preliminary design once the micro-simulation (VISSUM) traffic modelling has been completed. Consideration can then be given to measures to improve capacity including widening entry widths but this is likely to result in an ICD over the recommended size. In terms of impact to the MSA, discussions will be held with the developer on the interaction with their planning application.

5.2.3 *Link Road to Clock Interchange*

The 120kph (70mph) dual carriageway link road from the new southern junction to Clock Interchange is aligned to avoid the local village of Bickenhill with a horizontal curvature to the west of the village. This alignment requires no departures from standards.

The link is predominately in a cutting in order to minimise visual and environmental impact on Bickenhill and the surrounding countryside and passes underneath the existing Catherine de Barnes Lane in two locations. The design of the vertical alignment ensures that drainage has positive outfalls to Shadow Brook and Hollywell Brook.

5.2.4 *Alignment – slip road from the new link to Airport Way*

A dedicated northbound slip road would connect the new link road directly to Airport Way. This slip road would be designed with a 70kph (40mph) design speed, and require a minor DfS. The minor DfS, where the radii is reduced to 127m for a 70kph (40mph) design speed, is necessary to connect the proposed link with the existing airport free-flow link to avoid impacting the existing structure. The free-flow left should be developed with a taper diverge and a reduced speed limit. This should emphasise the message to the driver that they have left the dual carriageway. The free-flow left merges into existing Lane 1 of Airport Way as a lane gain (to remove merge conflict points) reducing to one lane further upstream.

5.2.5 *Alignment – connections to the local road network*

Local road connections occur via staggered slip roads, leading to two new roundabouts on the B4438, which allow connection to the new dual carriageway link and Clock Interchange. The northern roundabout (near Braceys Nursery) will accommodate southbound traffic, and the southern roundabout (near Birmingham Dogs Home) will provide a northbound connection. This has been developed to discourage the use of the link for rat-running on the local road network to Solihull, which is a local concern.

5.3 Option 2

Option 2 as shown on drawing HE551485-MOU-GEN-M42 J6-DR-CH-0008 has also been designed with a new southern junction (in a similar dumb-bell layout to Option1) with the M42, north of Solihull Road bridge, with a new dual carriageway link towards Birmingham Airport and Clock Interchange on the A45. The main difference to Option 1 is that the alignment of the new link road to Clock Interchange is positioned to the east of Bickenhill and passes underneath Church Lane in a deep cutting. It then emerges from the cutting to connect to a new roundabout, which would provide access to Clock Interchange and the B4438. The onward connection to Clock Interchange would be a dual carriageway with a 70kph (40mph) design speed. This connection would also incorporate a northbound slip road to Airport Way. The position and alignment of the southern junction with the M42 would be the same as for Option 1.

5.3.1 *Link to 'Bickenhill' Roundabout*

The 120kph (70mph) dual carriageway link is aligned to the east of Bickenhill village but due to the need to connect to Clock Interchange the alignment splits the village where it passes underneath Church Lane. The proposed link has a minimum horizontal radius of 720m which is one step below the desirable minimum (1020m). This is considered an acceptable relaxation in order to minimise impact to the surrounding area.

The vertical alignment has been designed so that the new road passes underneath the local roads of Shadowbrook Lane and Church Lane, which will remain on their current alignment. This results in long lengths of cutting and in particular, a deep cutting at the Shadowbrook Lane and Church Lane road crossings. There are short sections of embankment which in turn impacts on the openness of the green belt and is visually intrusive.

5.3.2 *Proposed Bickenhill Roundabout*

In order to provide a connection to the B4438, the local road network, and connection onwards to Clock Interchange, a new roundabout is proposed just to the north of Bickenhill. This roundabout would be at grade, and may need to be lit. The size of the roundabout is indicative based on initial traffic modelling results and alignment design to provide a safe and efficient layout - currently shown with a 100m ICD.

5.3.3 *Bickenhill Roundabout to Clock Interchange*

A new 70kph (40mph) dual carriageway link, would connect the new 'Bickenhill roundabout' to Clock Interchange. The southbound visibility on the link will be restricted by the existing structure to a minimum of 35m. In order to improve this significant DfS, it is likely that the structure supporting Airport Way would need to be extended.

A 70kph northbound slip road would diverge from this link to provide access to Airport Way, similar to Option 1. The diverge would start 80m from the roundabout, which apart from the DfS noted in Option 1, is considered outside the scope of standards.

5.4 Option 3

Option 3 as shown on drawing HE551485-MOU-GEN-M42_J6-DR-CH-0001 provides an 85kph (50mph) dual carriageway linking a junction on the M42, north of Shadowbrook Lane, with Clock Interchange. Due to the new junction's proximity to M42 Junction 6, it would preclude the ability to provide north facing slip roads onto the motorway and would be designed to provide a direct connection free flow link to the south. The new link road would cross over the M42 on a high, skewed bridge before passing beneath Church Lane, then re-surfacing to connect to a new roundabout to the north of Bickenhill. The connection to the B4438 and Clock Interchange would be similar to Option 2.

Option 3 is more visually intrusive than both Options 1 & 2 due to the high embankment over the M42 – M42 southbound merge link – which would impact on the openness of the green belt, impacting the views from both Bickenhill and Hampton-in-Arden.

5.4.1 Interchange Links

The design speed of the interchange links are based on TD 22/06 and will have an 85kph design speed. The location of the interchange links to the M42 has been based on two factors:

i. the requirement for successive diverge and merges with respect to M42 Junction 6; and
ii. the alignment to facilitate a safe connection to Clock Interchange which, as mentioned above, is via a new roundabout north of Bickenhill.

The alignment of the link is compliant for an 85kph design speed, except in one location:- a 255m radius is proposed for the southbound merge which is coincident with a reduced vertical alignment K of 30 (desirable minimum K=55). This has been included to minimise the impact at Church Lane where the alignment crosses under the existing local road (Church Lane). This option would also have the same DfS issues as Option 2, in the links between the new roundabout and Clock Interchange / Airport Way.

The interchange links have been designed to fit into a dual 3-lane motorway with DHS alignment to fit with the current M42 operations - with potential to improve it to a permanent dual four lane layout. However, this connection would not enable future widening of the M42 beyond a D4M carriageway and, consequently, this option would preclude future improvement of the M42 Junction 6. It would, however, be possible to widen using a lane-gain / lane-drop scenario.

The Interchange links could also preclude the future 'aspirational' development in the area and consequently constrain the possible growth in the Midlands, reducing the benefits HS2 would have on the region.

5.5 Free-Flow Links

The free-flow left turn lanes could be incorporated into all options, and would potentially provide additional benefit to the project. The existing free-flow left turn between M42 northbound and A45 westbound is retained. The aim of the improvement is to reduce traffic on the circulatory carriageway, reduce vehicle conflicts and to improve signal timing at the junction.

5.5.1 Detailed Geometry - Alignment

A summary of the alignment of the free-flow left turns is provided below. The design speeds will be 70 kph (40mph) unless the route is defined as an interchange link – where an 85kph (50mph) speed could be adopted. Examples of this free-flow left arrangement in other locations around the UK have been used to assist in developing the geometry e.g. at M40/A404, M6/M69, M69/M1 and M60/M62/M66 junctions.

A45 E to M42 N (North West Quadrant - outside NEC) – 70kph design speed.

The free-flow left turn in front of the NEC (north west quadrant of the roundabout) would pass beneath the existing NEC access and egress point onto the roundabout – thus introducing an underpass structure.

The free-flow left turn commences in the vicinity of the A45 eastbound diverge to the M42 Junction 6 roundabout and merges into lane 1 of the existing M42 northbound merge slip (providing a bypass to the roundabout and NEC access). This link (slip road) will require some changes to the existing network in order to meet technical standards due to successive diverges (Figure 4/4 of TD 22/06). The majority of the link is on a 400m horizontal radius and, due to the close proximity of a number of pylons, private NEC land and existing road networks, a number of retaining walls would be required to facilitate the free-flow link. There are a number of relaxations on the alignment mainly relating to vertical alignment. The alignment has been constrained by the need to link to the road network as well as clearance requirements when passing underneath the existing NEC access/egress. At two locations the crest curve is one step below desirable minimum (K of 20 instead of 30) and in one location a sag curve is two steps below desirable minimum (K=20), where a K value of 9 would be required.

M42 S to A45 E (North East Quadrant) – 85kph design speed.

This link (slip road) will require some changes to the existing network in order to meet technical standards (Figure 4/4 of TD 22/06 due to successive diverges). This will involve moving the diverge point on the M42 southbound 250m further north; changing the radius of the free-flow link onto Eastway (and removing the existing off-link from the roundabout to Eastway). There would also need to be some alterations to the local road connections to ensure Middle Bickenhill residents still have access to the road network, and can access the A45 via Stonebridge Island.

A45 W to M42 S (South East Quadrant – outside the NMM – 70kph design speed).

This link would diverge from the A45 westbound and provide a link to the M42 southbound merge from the M42 Junction 6. It would pass underneath the NMM existing access onto the roundabout. The existing connection from the southern access road to the A45 eastbound diverge would have to be stopped up, and the access road would be re-aligned, to connect to 'Eastway' via an underpass – beneath the A45. This would require all the businesses using the 'Access Way' to return to Stonebridge Island to access the wider road network. The geometry of this dedicated free flow link would have constrained geometry requiring a number of departures from standards, especially as the new carriageway enters into an underpass before rejoining the road network.

A CCTV camera survey at the NMM on Junction 6 carried out by Mouchel showed that while the amount of traffic exiting the NMM was not substantial, there were on

occasions a number of unsafe manoeuvres which could potentially lead to accidents at this location. Further development will be carried out in preliminary design.

M42 N to A45 W – 70kph design speed.

The proposed link road from the new southern junction to the A45 at Clock Interchange would reduce the need for traffic to use this existing free-flow link. It was recently modified by SMBC in conjunction with Birmingham Airport by changing priority and segregating traffic from the A45 westbound mainline. There may be a need to improve the right hand turn capacity from the M42 northbound to the A45 eastbound, which will be investigated during preliminary design and may require further alteration to this link.

5.6 Structures

There are thirty-three structures over a three-mile section of M42 between Friday Lane (two miles south of M42 J6) and P44a Sheet pile retaining wall (one mile north of M42 J6). There are eleven structures over a two-mile section of A45 between Stonebridge Island (one mile east of M42 J6) and Clock Interchange (one mile west of M42 J6). Refer scheme layout shown on Drawing HE551485 / MOU / GEN / M42_J6 / SK / CB / 0001.P02 contained in Appendix C. Details and conditions of these structures can be found in the TAR (document reference: HE551485-MOU-GEN-M42_J6-PC-Z-0007 and on Highways England's SMIS Database. Structures drawings for all options are also contained within Appendix C.

5.6.1 Option 1

Two structures will be required over the M42 to form the new southern junction (including a new structure to replace the existing Solihull Road bridge, structure ref: 4909).

To form the new link road to Clock Interchange, four new structures will be needed. It should be noted that the new structure which crosses Catherine De Barnes Lane may need to be constructed at a severe skew. There will also be a number of minor culverts and animal access tunnels required to ensure connectivity of watercourses is maintained. Protective slabs may be required to protect any services in the area. This option will also affect ten existing structures which may require strengthening, lengthening, widening and replacement works. This option is shown on drawing no.: HE551485 / MOU / GEN / M42_J6 / DR / CB / 0001.P01.

5.6.2 Option 2

Two structures will be required over the M42 to form the new southern junction (including a new structure to replace the existing Solihull Road bridge, structure ref: 4909). There will be three buried-box and two bridge structures required to form the new link road to Clock Interchange. There will also be a number of minor culverts and animal access tunnels required to ensure connectivity of watercourses is maintained. Some protective slabs may be required to protect the existing services. This option will affect ten existing structures which may require bridge strengthening,

lengthening, widening and total replacement of the structure. This option is shown on drawing no. HE551485 / MOU / GEN / M42_J6 / DR / CB / 0002.P01.

5.6.3 Option 3

Four new structures will be needed and include buried box structures, and multi-span flyover structures will be required to form the free-flow dual links to connect this option to the M42. There will also be a number of minor culverts and animal access tunnels required to ensure connectivity of watercourses is maintained. Protective slabs may be required to cover the existing services. This option will affect ten existing structures which may require bridge strengthening, lengthening, widening and total replacement of the structure. This option is shown on drawing no. HE551485 / MOU / GEN / M42_J6 / DR / CB / 0003.P01.

5.7 Clock Interchange

Clock Interchange is a grade separated junction which connects the A45 with the B4438. The junction currently includes a 2 lane roundabout situated above the existing A45 Coventry Road, on two bridge structures. The junction provides connections to Birmingham Airport, Birmingham International Railway Station, local business parks such as Trinity Park and local villages such as Bickenhill and Catherine de Barnes. The junction has been modified to include free flow links to the Airport from the A45, providing a direct connection to the M42 Junction 6.

As a result of the traffic modelling results for future traffic flows, Highways England propose to increase the existing circulatory to three lanes within the current extents of the structures. A structural assessment will need to be carried out at early stages of preliminary design to substantiate this proposal (see Appendix A). It is also proposed to improve the slip road from the roundabout to the A45 westbound, in order to improve the connection from the new link road to A45 westbound for traffic travelling to Birmingham.

The proposal is to utilise the full width of the structures and removing existing footways from the bridges. NMU facilities will be moved to a new footbridge / cycle bridge over the A45 to link the existing NMU route to the Airport and other major attractions north of the A45.

In general, approaches to Clock Interchange will need to be widened as a result of the increase in traffic flows – as indicated from an Arcady analysis. Following the ARCADY assessments and subsequent LinSIG runs, the design recommendations listed below should be taken forward to be assessed at preliminary design:

- An additional lane on the exit to Bickenhill Lane as this assists with lane balancing on the circulatory;
- All approaches to Clock Interchange to be widened to three lanes. However the new dual carriageway approach to Clock Interchange from the south will require the widened offside lane (lane 3) to be 20m in length developed as part of a flared approach. The impact of this additional lane on the existing Airport Way flyover is to be determined;

- Three lanes around the circulatory and three lane entries at A45 westbound and Bickenhill Lane, with the retention of the existing segregated left turn;
- Three approaches are controlled by signals and one approach with priority control (A45 eastbound).

5.8 Option 1 – Variants to Alignment

During the public consultation, an objection was raised by the GAA to Option 1 as it impacted a number of sports fields under their ownership. The facility is situated adjacent to the B4438 Catherine de Barnes Lane, west of Bickenhill village, and comprised three sports fields. A number of meetings were subsequently held with GAA and the project team looked at potential variants to the alignment which would lessen or totally avoid impact to the fields.

Three alternative options were subsequently developed and assessed – Options 1A, 1B and 1C; see Appendix A. Option 1A re-aligned the route to the west of the GAA sports fields entirely avoiding the facility but in turn affected the Bickenhill Meadows SSSI. Options 1B and 1C re-aligned the route to the east of the GAA sports fields. Option 1B was a compromise as it impacted one of the sports fields, but affected one property in Bickenhill. Option 1C avoided all three sports fields but had significant impact on the western side of Bickenhill.

Through the further meetings that were held and assessment on the land area impacted by all the variants, an understanding was reached with the GAA. This involves moving the existing facility to a new location in close proximity to their existing site and moving the link road to an Option 1B alignment. Precise details of this re-location are still to be agreed and negotiations are ongoing between Highways England and the GAA.

A general assessment of the options was carried out and this resulted in Options 1A and 1C to be discounted due to their impact on properties, impact on the SSSI and the slightly more complex arrangements for local road connections and structure skew over Catherine de Barnes Lane. Option 1B moves the road by approximately 50m from the alignment of Option 1 and is considered a viable alternative to Option 1 due to its reduced impact on the GAA fields. An assessment of the Option 1 additional variants has been carried out and the results are included in Appendix E.

5.9 Highways England's Preferred Option.

As a result of the assessment to the variations on the alignment, Option 1B was assessed as the best option to take forward due to its reduced impact on the GAA sports fields.

The south-east free-flow link was omitted due to the complexities involved in its design in providing a structure under the existing access to the NMM, including the considerable disruptive effect that its construction would have on that business. The link would also significantly impact all the businesses currently using the southern service road forcing their customers to return to Stonebridge Island via Eastway in order to access the wider road network.

The scheme would include a number of minor improvements around the M42 Junction 6 roundabout to improve the operation and safety of the flow on the junction in the short to medium term, and enable it to operate in the long term should further improvements to the M42 be made in the future.

A further change to the options taken to public consultation was the removal of the north facing slip roads from the new southern junction. The main arguments made for and against the northern slips were:

For:

- Improved Resilience both during construction and during future incidents on Junction 6 (especially during works on Junction 6);
- A number of the stakeholders wanted these included, as it would more closely meet their future aspirational need;
- Would reduce the amount of disruption due to the MSA construction if they were delayed until after the scheme was built.

Against:

- Would require agreement to a departure from standard (only 1100m from M42 Junction 6):
- Increase the potential for side-swipe accidents on the M42, therefore reducing the safety case for the scheme;
- The traffic model indicated that the south bound off slip would have approximately 300vph, and the northbound on slip would not be used. These extremely low traffic figures would not support the costs of the slip roads on their own, let alone the additional cost of improving the M42;
- The costs of providing mitigation for the DfS would significantly increase the scheme cost, requiring either further savings to be found, or change control to be agreed. This would have an effect on the economic case for the scheme

6 Summary of Tables of Traffic Economics, Costs

6.1 Introduction

The methodology for the economic assessment of a scheme is defined within WebTAG and supporting documents such as DMRB Volumes 12, 13 and 14, and the Transport Users Benefit Appraisal (TUBA) manual and user guide.

To meet the requirements of the above-listed documents, it was recognised that the economic appraisal would need to be undertaken using the LAM. Therefore, the network coverage for the LAM was determined using the Policy Responsive Integrated Strategy Model (PRISM) model to define an area of coverage that would account for changes in traffic patterns resulting from changes that are linked to the development of the local area. These included Birmingham Airport, the NEC, and the proposed HS2 station and UKC. The cumulative effects of these associated developments could then be accounted for in defining the study area. This will also ensure that the network coverage extends to include all links required for the accident analysis.

To summarise, the approach to the Stage 2 assessment of the M42 Junction 6 Improvement scheme is based on three-tiers of model:

- An updated version of PRISM was used to assess the strategic and demand impacts of the options tested as part of the scheme;
- A LAM was cordoned from PRISM, with a more detailed zoning system to assess local routing impacts; and
- An expanded and updated microsimulation model developed to test the operational impacts of options.

6.2 Approach

The approach to the economic assessment is fully documented in the Economic Assessment Report. In summary it consists:

- User Benefits – TUBA based on forecasts from the LAM;
- Accidents – Cost and Benefit to Accidents – Light Touch (COBALT) based on forecasts from the LAM;
- Construction & Maintenance Delays – Queues and Delays at Roadworks (QUADRO) for impacts on the M42 mainline; operational model for impacts on Junction 6;
- Reliability – operational model;
- Wider Impacts – Wider Impacts in Traffic Appraisal (WITA) based on forecasts and TUBA from the LAM.

HS2 has been taken as a committed scheme with a first year of operation as 2026. Therefore, in order to take account of the additional traffic and associated highway

works at this time, additional Do-Minimum and Do-Something forecasts for 2026 have been developed.

6.3 Progress

6.3.1 User Benefits

As a first step, forecasts were developed for Option 1, which highlighted the need for revisions to the highway network, particularly at the Clock Interchange. Following these refinements, forecasts were developed for Option 3, which highlighted a need for further adjustments to be made. These further adjustments have now been transferred into the networks for Option 1 so that the comparative assessments are on an equal basis. Once Options 1 and 3 had been adjusted, Option 2 was developed.

In order to reduce the timescale for the above iterative process, the assessment period has been curtailed to the period 2026 – 2082 (i.e. 60 years after scheme opening). It is not considered that the omission of the first three years' benefits will have a material effect on the comparative assessment.

6.3.2 Accidents

An assessment of accident benefits has been completed using COBALT. The results are summarised in Tables 6-1 to 6-3 below.

Option	Total without-scheme accident costs	Total with-scheme accident costs	Total accident benefits saved by scheme
Option 1	£999,708	£1,004,170	-£4,462
Option 2	£999,708	£1,006,282	-£6,574
Option 3	£999,708	£1,001,321	-£1,613

Table 6-1 Accident Benefits (£000, 2010 prices discounted)

Option	Total without-scheme accidents	Total with-scheme accidents	Total accidents saved by scheme
Option 1	21,265	21,360	-95
Option 2	21,265	21,416	-151
Option 3	21,265	21,289	-24

Table 6-2 Numbers of Accidents

Option	Total without-scheme casualties	Total with-scheme casualties	Total casualties saved by scheme
Option 1	29,809	29,942	-133
Option 2	29,809	30,021	-212
Option 3	29,809	29,844	-35

Table 6-3 Numbers of Casualties

The figures presented above indicate that there will be an increase in accidents and resulting disbenefit across the wider study area following the implementation of any of the scheme options.

Clearly, a forecast increase in accidents is of concern. The results arise from a switch in traffic from a motorway-standard route on to an all-purpose road. Within COBALT the latter is given a default accident rate based on the national average rate for new all-purpose dual carriageway roads which is above that for the M42 and gives rise to a forecast increase in potential accidents for traffic diverting to the new route. In addition, there is an increase in traffic flow forecast on sections of the M42, again giving rise to a forecast increase in accidents. Finally, there is an increase in the number of conflict points associated with the introduction of additional roundabout junctions, which also gives rise to a predicted increase in accident numbers. These increases are partially off-set by reductions on the section of the M42 that traffic diverts away from to use the new link and by some traffic switching from local roads (with typically higher accident rates) to the new link road and/or the motorway.

An investigation was undertaken to abstract the impacts on the strategic road network. The results are summarised in Table 6-4 below and show that with Options 1 and 2 a small benefit is predicted to occur on the strategic road network but with Option 3, a small decrease is forecast.

	Option1		Option2		Option3	
	total change of accident costs	total change in accidents per annum	total change of accident costs	total change in accidents per annum	total change of accident costs	total change in accidents per annum
SRN	£531.30	0.18	£1,390.90	0.47	-£714.20	-0.28

Table 6-4: Comparison of accidents on SRN vs Total

A separate safety assessment has also been undertaken for the existing roads comprising the strategic road network in the assessment area around Junction 6. A summary of the assessment is provided at Appendix C. The assessment took the form of an investigation into the underlying causes of accidents over a 5-year period 2010-2014 inclusive, and identification of those causes that could be addressed as part of the scheme design process. The assessment concluded that there was a realistic potential to reduce accidents on the strategic road network by some 1.84

accidents per annum which, if successful would deliver a benefit based on the average accident costs from the COBALT assessment of £5.19m over the 60 year appraisal period. Taken together, the scheme and associated preventable accident measures would result in overall net benefits with Options 1 and 3 but leave a net disbenefit with Option 2. These results are summarised in Table 6-5 below.

Option	Total without-scheme accident costs	Total with-scheme & preventable accident costs	Total accident benefits saved by scheme
Option 1	999,708	998,980	728
Option 2	999,708	1,001,092	-1,384
Option 3	999,708	996,131	3,577

Table 6-5 Accident Benefits (£000, 2010 prices discounted to 2010)

6.3.3 Construction and Maintenance Delays

Buildability advice, including the anticipated duration of traffic management during construction, has been obtained from Skanska. This information has been used to develop the QUADRO assessment for the planned interventions on the M42 mainline during the construction of the bridge works. Assessment of the impact on users during construction works on Junction 6 itself is ongoing. An initial set of runs for Option 1 and 2 has confirmed that it is preferable to complete the construction of the new link road prior to commencing works on Junction 6 in order minimise impacts on road users.

It has not proved possible to obtain details of forward planned maintenance on either the M42 or A45. The current approach is to intervene on a needs basis rather than in line with a regular schedule of maintenance. Therefore, for the purposes of the assessment, a 15 year cycle of resurfacing and reconstruction has been assumed. The programme of activities has been assumed to remain constant under both Do-Minimum and Do-Something assessments but the changes in user delays arising from the change in traffic flows is captured.

User delay costs associated with the interventions on the M42 mainline during construction are summarised in Table 6-6 below.

	Option 1 & 2	Option 3
4 Weeks - Full Night Closure	£5,741,421	£5,041,974
23 Weeks - Standard Day & Night Lane Reduction	£22,045,814	£17,739,708
Totals	£27,787,235	£22,781,682

Table 6-6: User Delay Costs during Construction – M42 Carriageway

User delay costs during maintenance are summarised in Table 6-7 below.

	Do Minimum (No diversion)	Option 1 & 2	Option 3
Totals	£340,936	£182,312	£250,042

Table 6-7: User Delay Costs during Maintenance

Based on the results, Options 1 and 2 produce the least delay costs, and therefore provide the highest savings when related to the current maintenance regime with savings of £158,624, while Option 3 provides a saving of £90,894. Descriptions of the various modelled scenarios are provided in the Traffic Forecasting Report (Ref: HE55184-MOU-00-XX-PC-TR-0009).

6.3.4 Reliability

The current position is that the forecasts output from the LAM runs are being converted for application in the operational model. Accordingly to date the reliability assessment has not been completed and will be undertaken during preliminary design - but is not considered to have a material effect on the overall assessment

6.3.5 Wider Impacts

The WITA assessment tool has been used to forecast the potential level of wider economic benefits for all options.

Economics and employment data for each WITA analysis zone were derived from the WITA data book obtained from the DfT sourced from the Highways England website. This included, at a Local Authority District (LAD) level, economics and employment data (2014). The economic data include GDP per worker by four employment sectors (manufacturing, construction, consumer services and producer services), the average wage per worker and index of labour productivity for each LAD.

Employment data for the four employment sectors described above and for the forecast years 2026, 2031 and 2041 for each LAD were also obtained from the WITA data book.

The generalised cost of travel between WITA zones is derived from transport model data extracted from the main economic appraisal (i.e. TUBA files) – a combination of time, distance and charges for the various scenarios and the forecast years of 2026, 2031 and 2041.

A commuter production-attraction file was also developed and incorporated into the WITA model which allows for a more accurate estimate of labour force benefits. Data have been taken from NTEM to produce commute factors and from the National Travel Survey to obtain production and attraction data for journeys between modelled origins and destinations.

Public transport modes have been omitted from the process as they are not included within the modelled matrix. While it is normally expected that Passenger Transport (PT) outputs would significantly increase the benefits calculated as part of the of Wider Impacts Assessment for a transport scheme, the relative lack of PT interaction at Junction 6 limits the likely PT benefits, however with the inclusion of HS2 in the future this may change and any likely additional PT impacts should be considered within Stage 3.

The WITA model provides a detailed summary of benefits by year and by category summarising the main WITA elements of agglomeration impacts, increased competition, output change and tax revenues. As would be expected due to the location, existing conditions and proposed scheme the agglomeration impacts are the largest contributor to the forecast benefits.

The wider economic benefits are summarised below in Table 6-6. These have been calculated using the Mouchel WITA-compatible spreadsheet tool/software. In all cases agglomeration provides the most significant benefit.

Increased output in imperfect competitive markets is calculated as a proportion of the total business user benefits of the main economic appraisal.

Total Wider Benefits	2026	2031	2041	60 years
Option 1	3,303	-1,909	6,023	248,825
Option 2	2,315	-272	2,248	99,096
Option 3	3,779	718	6,598	293,040

Table 6-8: Summary of Wider Impact Assessment
(Note: all values are in thousands of pounds (£000s), expressed in 2010 market prices and values)

A benefit of £248 million has been achieved for Option 1 wider economic benefits over a 60 year period, for Option 2 the total benefit is forecast to be £99 million, while Option 3 is forecast to produce a total benefit of £293 million over the 60 year period. As the traffic model is not multi-modal, i.e. it excludes public transport, cycle and pedestrian modes, the wider benefit assessment tool over-estimates the scale of benefits because it assumes the whole population is able to take advantage of the highway improvements.

Based on previous studies, it is considered that to take account of the exclusion of public transport, walk and cycle modes from the assessment, a net benefit of 30% of the total should be attributed to the highway–only assessment to bring the total within the expected range stated within TAG of between 10% and 30% of total Transport Economic Efficiency (TEE) benefits giving a net additional benefit of £74.6M, £30.0M and £87.9M to Options 1, 2 and 3 respectively. These additional wider economic benefits can be added to the initial ‘unadjusted’ benefit to cost ratio to provide an ‘adjusted’ value, as shown in Table 6-13 in the summary section below.

6.3.6 *Scheme Costs*

Cost estimates for all options considered in detail through the options phase have been provided by Highways England Commercial Services Division (HECSD). As these are Order of Magnitude (OME) estimates of the outturn scheme costs, they include values for inflation to 2023. In order to compare to the economic benefits identified by the traffic model these estimates have been converted to the same 2010 price base. The original estimates included the costs of all of the free flow links at the M42 Junction 6. Following the decision to remove the free flow link from the southeast quadrant, these costs were removed from the OME, prior to the Benefit Cost Ratio being derived. Consequently, It should be noted that as the benefits include the southeast free flow link, there is a minor mismatch between benefits and costs.

Further work will be undertaken during preliminary design to refine the scheme economics as more definition is added to the outline design in the future. In summary, the available results are set out in Table 6-9 below.

Most likely estimates	Option 1	Option 2	Option 3
Base estimate (Q1 2014 exc Risk & Inflation)	200.1	191.9	166.6
Option estimate (inc Risk & Inflation)	328.7	316.7	269.4

Table 6-9: Scheme Cost Estimates (Q1 2014, £m)

It should also be noted that the MSA, if planning approval is given, would provide a significant benefit to Options 1 and 2 – reducing the scheme cost, making them cheaper than Option 3.

Present Value Cost must be used in cost-benefit analysis. This requires discounting to the DfT's base year (2010) and converting to market prices. This is done using values in Transport Analysis Guidance (TAG) Unit A1.2:

- Discount rate: 3.5% per year;
- Conversion to market prices: indirect tax conversion factor of 1.19.

	2016	2017	2018	2019	2020	2021	2022	Total
Preparation	1,123	3,844	4,985	5,937	0	0	0	15,888
Supervision	0	0	0	0	3,016	2,186	92	5,295
Works	0	0	0	3,106	82,577	75,712	5,746	167,141
Lands	5,391	0	0	19,191	0	0	0	24,582
Total	**6,514**	**3,844**	**4,985**	**28,234**	**85,593**	**77,899**	**5,838**	**212,907**

Table 6-10: Present Value Cost (based on Option 1, £000s)

Table 6-10 shows the effect of this discounting for Option 1, giving a Present Value Cost (PVC) of £212.9M. The equivalent total PVC for Options 2 and 3 have been estimated as £204.4M and £174.6M respectively.

6.3.7 Risk and Inflation

Project Risk was assessed by Highways England Commercial based on the Risk and Opportunities register and adjusted to allow for the early stages of Options design. A further allowance was also made by Highways England Commercial for Portfolio Risk. Finally estimates for inflation were based on projected outturn costs in 2023.

6.4 Summary of Economic Assessment Process and Discussion of Results

The economic assessment of the scheme options identified for public consultation adopted an approach in line with TAG Unit A1 using standard software and practices. The economic appraisal extends over a 60 year period from scheme opening year (2023) in line with DfT guidance. The following impacts have been monetised:

- Road user benefits (TUBA) – changes in travel times, vehicle operating costs, indirect tax revenues and greenhouse gases;
- Accident savings (COBALT) – resulting from changes in the number and severity of accidents;
- Construction impacts, i.e. monetisation of delays incurred by users due to temporary traffic management (quantified using QUADRO for M42 and VISSIM for Junction 6); and
- Wider economic benefits (WITA) –the economic impacts of transport that are additional to transport user benefits.

At the time of writing, not all aspects of the assessment have been completed. Table 6-11 below provides a summary of the current status. The elements of the assessment that have not been completed to date will be undertaken during preliminary design but are not considered to have a material effect on the overall assessment.

Assessment	Option 1	Option 2	Option 3
User Benefits	Complete	Complete	Complete
Construction Delays	Complete – M42 mainline only	Complete – as Option 1	Complete – M42 mainline only
Maintenance Delays	Complete	Complete	Complete
Accidents	Complete	Complete	Complete
Reliability	Not Complete	Not Complete	Not Complete
Wider Impacts	Complete	Complete	Complete

Table 6-11: Status of Economic Assessment

To obtain the unadjusted BCR values, the impacts from the following aspects of the appraisal are included: user benefits, accidents; construction delays and maintenance delays.

In order to produce the adjusted BCR values, consideration of wider impacts and journey time reliability are included. At this stage, the BCRs have only been adjusted to reflect the wider impacts assessment. Values from the reliability assessment are not currently available. Consequently, the BCRs identified below are conservative, and should improve as the scheme is refined.

Depending on the assessed value of the Adjusted BCR, the scheme is attributed a Value for Money ranking, as illustrated in Table 6-12 below.

Adjusted/Unadjusted	Value for Money
Less than 1	Poor
Between 1 and 1.5	Low
Between 1.5 and 2	Medium
Between 2 and 4	High
Greater than 4	Very High

Table 6-12: Value for Money Bands

On the basis of the results of the assessment completed so far, the unadjusted and adjusted values for the BCRs for the options are summarised in Table 6-13 below.

	Option 1	Option 2	Option 3
Present Value of Benefits (£000's)	295,885	98,101	350,093
Present Value of Costs (£000's)	212,907	204,390	174,583
Unadjusted BCR	1.4	0.5	2.0
Wider Impacts	74,600	29,700	87,900
Adjusted BCR	1.7	0.6	2.5
Value for Money	Medium	Poor	High

Table 6-13: Unadjusted and Adjusted BCRs

6.5 Conclusion

Whilst it is clear that Option 3 is emerging as the highest performing option in terms of economic performance, it is currently the cheapest and attracts the most traffic from the junction.

It should also be noted that the MSA, if planning approval is given, would reduce the net costs of Options 1 and 2, which could increase the VfM score for Option 1 to a 'High' value.

7 Summary of Operational Assessment

This chapter presents a summary of the implications of each of the options on the safe operation of the network and maintenance of the completed scheme. It provides a high level qualitative assessment of the options, identifying the lane provision required for projected traffic flows and the merge and diverge layouts required in accordance with TD22/06.

7.1 Determining the baseline of the assessment for the proposed options

The assessment is based on the M42 operating with the existing DHS in operation as instigated in the original ATM Pilot scheme in 2006, i.e. as a dual 3 lane motorway, with the ability to open the hard shoulder at peak times where required, except for the following changes for each of the proposed options:

Option 1 and Option 2

The assessment for Options 1 and 2 assumes that both north and south facing slip roads would be included in the new southern junction (described as M42 Junction 5a below).

The assessment assumes that the M42 dynamic hardshoulder operation between the new junction (M42 Junction 5a) and M42 Junction 6 is converted to a permanent four lane operation (as shown in Fig 7-1). The need for this permanent four lane operation solution is due to the minimal link length and the resulting reduction of signalling infrastructure required to operate DHS in an effective and safe manner between the junctions. The operational regime through M42 Junction 5a will be for all four lanes to run through the junction in both directions to mitigate for the short weaving lengths between M42 Junction 5a to M42 Junction 6.

The assessment assumes that there would be a lane drop / lane gain arrangement on the approach to M42 Junction 6.

The assessment assumes that no MSA is connected to M42 Junction 5a. The MSA application will need to consider the impact their traffic using the north facing slips on this junction, and the mitigation that will be required in order to address their impacts on the M42 as part of their planning application.

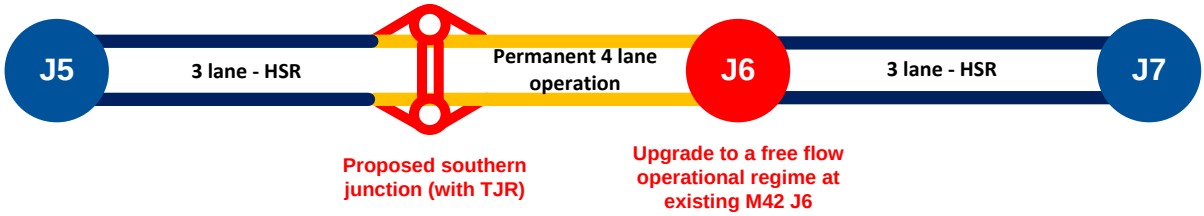


Figure 7-1 - Operational concept for M42 Junction 6 Option 1 and Option 2

Option 3

The assessment assumes that the M42 dynamic hardshoulder operation between the new junction (M42 Junction 5a) and M42 Junction 6 is converted to a permanent four lane operation (as shown in Fig 7-2). This is due to the impacts of the minimal link length between M42 Junction 5a and Junction 6 and the incorporation of through merge (southbound) and diverge (northbound) running to offer through flow of traffic at M42 Junction 5a continuing north to M42 Junction 6. The link length also reduces the spacing capacity to provide signalling infrastructure required to operate DHS in a safe and effective manner.

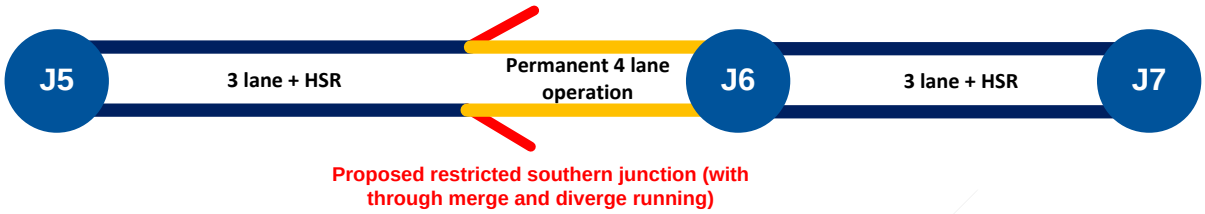


Figure 7-2 - Operational concept for M42 J6 Option 3

7.2 Assumed option design and implications on capacity requirements

Operational capacity needs for the scheme have been based upon the LAM. The peak hour traffic flows for the design year have been used to determine the most appropriate operational solution for each link and junction in terms of required capacity and junction layout. Table 7-1 to Table 7-6 show the modelled peak hour flows for 2041 for the M42 northbound and southbound directions respectively for each of the proposed options. *(see table overpage)*

7.2.1 Option 1

Junction	2041 Peak Hour Flow	Existing lane provision	TD22/06 required no. of lanes for 2041 Peak Hour (1800vph/lane)	Design decision
Northbound				
J5 to J5a	8711 (AM)	3 + DHS	5	4
J5a intra-junction	6693 (AM)	N/A	4	4
J5a to J6	6693 (AM)	3 + DHS	4	4
J6 intra-junction	5289 (IP)	3	3	3
J6 to J7	9549 (PM)	3 + DHS	6	4
Southbound				
J7 to J6	8279 (AM)	3 + DHS	5	4
J6 intra-junction	5240 (AM)	3	3	3
J6 to J5a	6517 (AM)	3 + DHS	4	4
J5a intra-junction	6440 (AM)	N/A	4	4
J5a to J5	7366 (AM)	3 + DHS	5	4

Table 7-1 - Link capacity requirements – existing and proposed (Option 1)

Junction	2041 peak hour flow	TD22/06 layout 2041 flows	Proposed Diverge / Merge layout
Northbound			
M42 J5a diverge	2016 (AM)	Type D	Type B (option 1)
M42 J5a merge	0	Not required	
M42 J6 diverge	2301 (AM)	Type D	As existing
M42 J6 merge	4260 (PM)	Type G	Type F
Southbound			
M42 J6 diverge	3038 (AM)	Type E	Type B (option 2) (HS closed) Type D (HS open) *With an extended auxiliary lane*
M42 J6 merge	1745 (PM)	Type F	Type F
M42 J5a diverge	333 (PM)	Type A	Type A
M42 J5a merge	926 (AM)	Type E	Type C (ghost island)

Table 7-2 – Junction requirements – existing and proposed (Option 1)

7.2.2 Option 2

Northbound Section	2041 Peak Hour Flow	Existing lane provision	TD22/06 required no. of lanes for 2041 Peak Hour (1800vph/lane)	Design decision
Northbound				
J5 to J5a	8559 (AM)	3 + DHS	5	4
J5a intra-junction	7227 (AM)	N/A	5	4
J5a to J6	7229 (AM)	3 + DHS	5	4
J6 intra-junction	5312 (PM)	3	3	3
J6 to J7	9533 (PM)	3 + DHS	6	4
Southbound				
J7 to J6	8320 (AM)	3 + DHS	5	4
J6 intra-junction	5280 (AM)	3 lane	5	4
J6 to J5a	6564 (AM)	3 + DHS	4	4
J5a intra-junction	6393 (AM)	N/A	4	4
J5a to J5	7290 (AM)	3 + DHS	5	4

Table 7-3 – Link capacity requirements – existing and proposed (Option 2)

Junction	2041 peak hour flow	TD22/06 layout 2041 flows	Proposed Merge / Diverge layout
Northbound			
M42 J5a diverge	1332 (AM)	Type A	Type B
M42 J5a merge	0	Not required	
M42 J6 diverge	2697 (AM)	Type E	As existing
M42 J6 merge	4221 (PM)	Type G	Type F
Southbound			
M42 J6 diverge	3040 (AM)	Type E	Type B (option 2) (HS closed) Type D (HS open) *With an extended auxiliary lane*
M42 J6 merge	2406 (PM)	Type D	As existing
M42 J5a diverge	415 (PM)	Type A	Type A
M42 J5a merge	896 (AM)	Type E	Type C

Table 7-4 – Junction layouts – existing and proposed (Option 2)

7.2.3 Option 3

Northbound Section	2041 Peak Hour Flow	Existing lane provision	TD22/06 required no. of lanes for 2041 Peak Hour (1800vph/lane)	Design decision
Northbound				
J5 to J5a	8778 (AM)	3 + DHS	5	4
J5a to J6	75971 (AM)	3 + DHS	4	4
J6 intra-junction	5301 (PM)	3	3	3
J6 to J7	9369 (PM)	3 + DHS	6	4
Southbound				
J7 to J6	8262 (AM)	3 + DHS	5	4
J6 intra-junction	5146 (AM)	3	3	3
J6 to J5a	6294 (AM)	3 + DHS	4	4
J5a to J5	7434 (AM)	3 + DHS	5	4

Table 7-5 – Link capacity requirements – existing and proposed (Option 3)

Junction	2041 peak hour flow	TD22/06 layout 2041 flows	Proposed Merge / Diverge layout
Northbound			
M42 J5a diverge	2807 (AM)	Type D	Type B
M42 J6 diverge	1571 (AM)	Type D	As existing
M42 J6 merge	4068 (PM)	Type G	Type F
Southbound			
M42 J6 diverge	3116 (AM)	Type E	Type B (option 2) (HS closed) Type D (HS open) *With an extended auxiliary lane*
M42 J6 merge	1571 (PM)	Type F	As existing
M42 J5a merge	1140 (AM)	Type E	Type C

Table 7-6 – Junction layouts – existing and proposed (Option 3)

Tables 7-1 to Table 7-6 indicate a number of under provisions in terms of slip road layouts and the number of lanes required on the M42 mainline occurring by the scheme's design year of 2041. This clearly demonstrates that further improvements

will be required to both the M42 mainline, and perhaps the junction in the medium to long term.

7.3 Microsimulation Analysis

Microsimulation analysis is required to confidently determine what the likely effects of the various options would be on traffic operation to the circulatory carriageway of Junction 6 for the short term (opening year) and medium term (design year). This will be undertaken during preliminary design as part of design development.

However, it is anticipated that the options will have a minimal variance on the operational impact of the new link road from Clock Interchange to the new southern junction.

7.4 Ramp Metering Implications

7.4.1 M42 J6 northbound on-slip

This site was re-calibrated (as part of Highways England ramp metering (RM) re-calibration and review project) in October / November 2015 and February 2016. The ramp was experiencing peak flows of 2800 vph, well beyond the maximum of 2500 vph, with these periods often coinciding with events finishing at the NEC.

Given that the new free flow link proposal does not directly interact with the ramp from the gyratory, it is likely that the RM site, with traffic flows reduced to well below the 2500 vph limit and with careful re-calibration, could become a productive site once more. A micro-simulation of the northbound ramps would help confirm this analysis.

However, the proposed layout at M42 J6 northbound would require the signal heads to be moved to approximately 95m from the start of the slip road, which will in all likelihood be far too short for practical ramp metering purposes, leading to queuing back onto the M42 J6 gyratory, which all the improvements has been designed to eliminate. Even positioning the signal heads as far downstream as possible, which would likely require a change in design to the proposed M42 J6 ramp layout, or a departure, would result in only 150m of queuing space, which would still be considered short for the estimated amount of traffic using this slip. To this end there is a strong case to be made for the removal of the current RM system once work on the overall scheme commences and possibly earlier.

Accurate modelled flows/microsimulations for M42 J6 northbound on-ramp would assist in clarifying this.

7.4.2 Implications of M42 J6 to J7

The introduction of the northbound free flow left turn outside the NEC may potentially reflect the existing similar operational arrangement where the current inside merge lane to M42 Northbound can be underused. The outside lane that merges immediately with the M42 mainline traffic, appeared to have the higher flow. Possible reason for this traffic characteristic is that the inside lane gain has an MS4

sign states it is for ‘M42 J7 exit only’ on the first gantry and drivers who are familiar with this arrangement and wish to remain on the M42 past Junction 7 do not wish to either:

- Contradict this instruction, and or;
- Lane change across traffic to their right at the same time as those on the mainline are lane changing towards the left as the J7 diverge approaches.

The result of this explains the absence of frequent congestion at the M42 Junction 7 diverge, but does put more challenge upon the immediate merging into LBS2 of the mainline, from the outside lane of the on-ramp. Additionally the mainline through traffic at M42 Junction 6 is obscured from the M42 Junction 6 merge by a left hand curve in the mainline until the merge is almost upon them, which may cause some late breaking and lane changing, greatly increasing the likelihood of traffic flow breakdown. An assessment of the signing strategy during preliminary design with the new improvements would assist in resolving these issues.

7.5 M42 Junction 6 Southbound On-slip

If the ramp metering site is retained, a safety assessment would need to be undertaken. From a traffic flow aspect the reduced flow using the signalised roundabout ramp would likely bring the peak flow below the 2500 vph limit currently exceeded and would, with re-calibration, likely make the site more productive.

8 Summary of technology and maintenance assessment

8.1 Technology implications and requirements assessment

As part of the options considered for the M42 Junction 6 improvement scheme, an impact assessment to understand the technology requirements and the operational implications on the technology required for the three options was undertaken. The following standards were referenced to aid the assessment:

- IAN112/08 – MM Implementation Guidance: Through Junction Running
- IAN111/09 – MM Implementation Guidance: Hard Shoulder Running
- IAN161/15 – Smart Motorways
- IAN149/11 – Existing Motorway Minimum Requirements
- TD22/06 – Layout of Grade Separated Junctions
- TD46/05 – Motorway Signalling

An impact summary assessment was undertaken to determine the effect upon M42 mainline technology infrastructure and operational regimes within the scheme that may be affected as a result of the option proposals. The assessment covers the following key impacts:

- Replacement / relocation of existing gantries on M42 main carriageway impacted by construction of proposed junctions and by new / altered merge and diverge layouts;
- Replacement / relocation of strategic 3x18 character MS3s on M42 main carriageway;
- Replacement / relocation of gantry mounted AMIs and MS4s on M42 main carriageway.

Schematics have been produced which illustrate the impacts on the existing infrastructure and supporting tables adjacent to the schematic plans details a summary of the impact these can be found within Annex I and titles are tabulated in Table 8.1 below.

Table 8.1 *(overpage)* outlines the reference to each associated impact schematics. As the variance between Option 1 and 2 is minimal as far as technology and signing is concerned, only one impact assessment has been carried out for these options.

Link	Figure
Option 1 and 2	
M42 J6 to J7 – Northbound	Figure 8-1
M42 J5a to J6 – Northbound	Figure 8-2
M42 J5 to J5a - Northbound	Figure 8-3
M42 J7 to J6 – Southbound	Figure 8-4
M42 J6 to J5a – Southbound	Figure 8-5
M42 J5a to J5 – Southbound	Figure 8-6
Option 3	
M42 J6 to J7 – Northbound	Figure 8-7
M42 J5a to J6 – Northbound	Figure 8-8
M42 J5 to J5a - Northbound	Figure 8-9
M42 J7 to J6 – Southbound	Figure 8-10
M42 J6 to J5a – Southbound	Figure 8-11
M42 J5a to J5 – Southbound	Figure 8-12

Table 8-1 – Reference list for impact assessment schematics

8.2 Other Key Technology Impacts

Other key technology assets have been reviewed to determine the impacts upon them through the introduction of the three proposed options and are summarised in table 8-2 below.

Technology feature	Impact on technology features for all proposed options
Closed Circuit Television	Additional PTZ CCTV cameras required to provide surveillance of new southern junction and slip roads. Relocation of or additional fixed hard shoulder CCTV cameras required due to reconfiguration of SM-HSR links Reduced requirement for fixed hard shoulder cameras (not required on M42 J5a to J6 link due to ALR intervention) Increased requirement for PTZ CCTV cameras on M42 J5a to J6 link due to ALR intervention (100% coverage required).
Vehicle Detection	Main carriageway radar will need to be relocated / reconfigured to reflect revised signal positioning). New loops / radar required on M42 J5a slip roads. Existing M42 J6 slip road loops will need to be reconfigured to reflect revised slip road layouts
Speed Enforcement	Existing HADECS3 provision will need to be reviewed during future design stages for suitability in relation to the M42 J5a, alterations to the existing M42 J6 slip road merges and diverges, and potential visibility issues due to other proposed new infrastructure such as overbridges.
Emergency Roadside Telephones	Relocation of existing ERTs where ERAs have been removed Provision of ERTs where new ERAs are proposed to be included

Technology feature	Impact on technology features for all proposed options
Ramp Metering	Existing M42 J6 northbound and southbound on-slip ramp metering sites to be re-assessed during future design stages with design year model traffic flows, and if retained re-configuration will be required to reflect on-slip layout.
Equipment Cabinets	New or relocation of existing Combined Equipment Cabinet (CEC) cabinets required to reflect new/relocated gantries New or relocation of existing standard Type 609 and Type 600 cabinets required to reflect new or relocated equipment on slip roads. New Type 609 cabinets required for any new electricity supply points required for technology equipment. New feeder pillar cabinets required for any new electricity supply points required for motorway lighting
Communications Network	Bypass cables for longitudinal NRTS cables and associated infrastructure such as temporary ducting will be required during the construction period. Installation and maintenance of bypass cables and associated infrastructure will need to be installed and maintained throughout construction in a manner that ensures that the integrity of the cables is not compromised by the construction works, e.g. bypass cables routed in central reserve. The scheme will also need to provide suitable infrastructure, e.g. ducting and chambers, to accommodate the reinstated permanent NRTS longitudinal cables. There may be a requirement for strategic 3x18 character MS3s within the scheme to remain operational during construction, which will require connection(s) to the NRTS bypass cable or provision of alternative temporary communications link(s), e.g. SPICE
Power Supplies	Potential new electricity connection points required for new/relocated Technology equipment. Potential new electricity connection points required for reconfigured motorway lighting
Lighting	A TA 49 lighting assessment will need to be carried out for the proposed scheme, the details and outcomes will be detailed during future design stages. If retention of lighting is confirmed by TA 49 assessment, new or relocation of existing lighting infrastructure will be required to reflect revised slip road layouts at M42 J6 and M42 J5a, including associated links to the existing road network.
Temporary Systems During Construction	Majority of permanent technology equipment will be disabled during construction therefore temporary systems will need to be put in place, e.g. average speed enforcement camera, temporary VMS/journey time information system. There may be a requirement for strategic 3x18 character MS3s within the scheme to remain operational during construction, which will require connection(s) to the NRTS bypass cable or provision of alternative temporary communications links, e.g. SPICE
Technology Systems	Updates required to HATMS site data (message signs, signals, and MIDAS & HSM subsystems), CCTV in station site data and HE Gazetteer data to reflect new/revised on-road equipment provision.

Table 8.2 Key Technology Impacts

8.3 A45 Technology Review

With the improvement to M42 Junction 6 in terms of an A45 EB to M42 NB free-flow link and the installation of a proposed new southern junction between Junction 5 and

Junction 6 on the M42, with a link road to the Clock Interchange, this section looks at possible improvements for the A45 on the approaches to the A45/M42 grade-separated interchange at Junction 6, particularly in terms of signing. The proposed link road from Junction 5a to the Clock Interchange will also be considered in terms of signing.

8.3.1 Clock Interchange Signing Options

The Clock Interchange serves as the A45 conduit to both Birmingham Airport and Birmingham International Railway Station, which serves both the airport and the NEC. Additionally a number of businesses access the A45 from the Clock Interchange, as shown in Fig 8.1 below. This new link is designed to take away traffic from the busy Junction 6 signalised roundabout, allowing more direct access to and from the M42 for the airport and railway station.

The new proposals have the interchange linking to the M42 via the additional link created by the new southern junction. There is an opportunity to supplement the road design with intelligent signing around the Clock Interchange, to better inform the driver as to the optimum route to take, particularly when leaving the above mentioned sites. This is especially the case for when the NEC is hosting large events and Junction 6 gets congested. For example, there may be occasions where drivers would be better served accessing the M42 northbound at the new southern junction rather than Junction 6.

For any signing to be successful, coordination with the local highways authority and Airport would be paramount to ensure the optimum information is being made available to the driver. The proposed approximate locations for the signs (likely reduced MS4s) are identified by red dots in Figure 8.1.

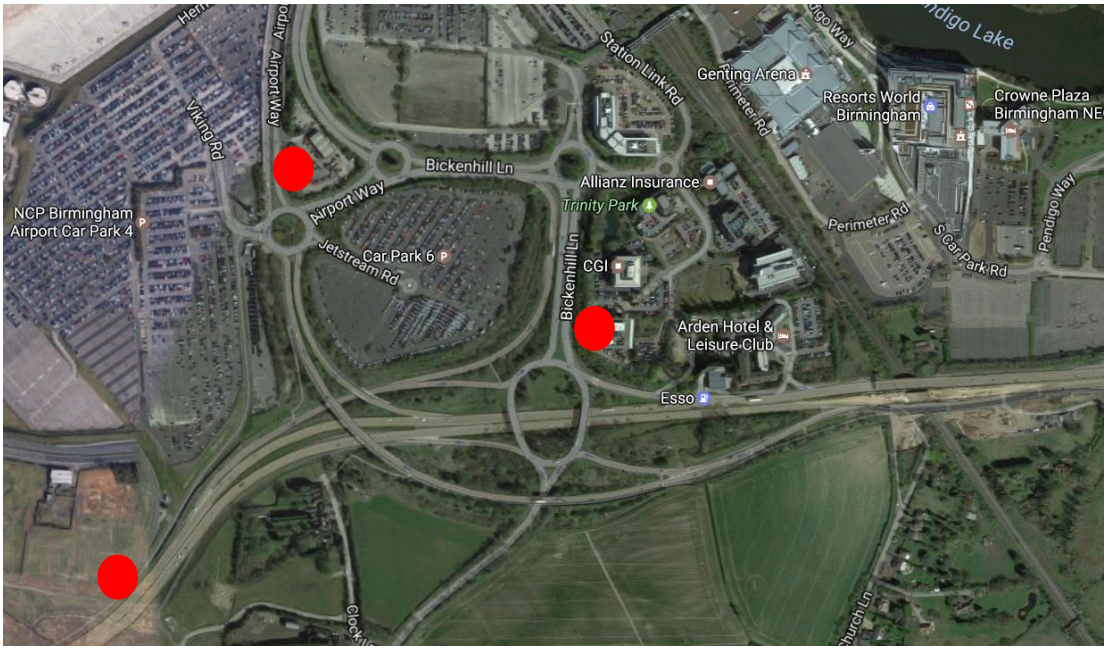


Fig 8.1 Clock Interchange with MS4 sign locations

All the locations are such that they allow drivers to make a decision based on the information, as to which way they would access the M42 (and even the M6 if they have sufficient local knowledge to use the B4438 to access the A446/M6 via Junction 4).

8.3.2 New Link Road Signing

For the options being considered for the exact nature and layout of the proposed new southern junction itself and the link road to Clock Interchange.

Regardless of the option selected, there will be an opportunity to provide additional information to the driver. On the southbound route from the Clock Interchange towards the new southern junction, appropriate signage (such as an MS4) could provide journey time information to various locations, both on the M40 and M42 (if a restricted junction chosen) and possibly the M6 if desired. It would be important that the information on this VMS would be consistent with those discussed above.

In the northbound direction a VMS could give information of travel on the A45 or even of delays at the airport (not individual flights, but of delays due to weather or incidents).

In addition to all of the above, the NEC have ongoing arrangements in place with Highways England for re-routing traffic exiting from big events in a more wide-ranging pattern, utilising various routes to best serve the visitors leaving the site, as well as those drivers in the area at the time. For example, it is anecdotally known that locals to the area avoid using the Junction 6 exit from the NEC wherever possible, finding slightly longer, but considerably quicker routes away from the NEC site. That said, with the improvements elsewhere taking traffic away from M42 Junction 6, it may be that the NEC can utilise this exit to empty its car parks more efficiently. Micro simulations may assist in the understanding at this location.

8.4 Other Technology Schemes

Area 9 Area Support Contract (ASC) has provided details of other technology schemes that are being planned that may have an impact on the proposed M42 Junction 6 Improvement scheme; these are described below. Further technology assessments will be undertaken in the next stages to identify where technology can support and enhance the scheme operation. Where proposed technology schemes are identified below efficiencies can be achieved coordinating design activities through collaborative working with Area 9 ASCs.

8.4.1 Birmingham Box Strategic MS3 Replacement

Replacement of life-expired strategic MS3s located at key nodes on the Birmingham Box motorway network, including M42 Junction 3a-7, is planned to be undertaken during 2017/2018.

8.4.2 M42 Infill CCTV

Provision of additional infill PTZ CCTV surveillance cameras at locations identified through liaison with West Midlands Regional Control Centre (WMRCC) operators,

plus relocating existing gantry mounted PTZ CCTV cameras to masts located in the verge. Delivery of this scheme is currently planned for 2017/2018.

8.4.3 Connected Intelligent Transport Environment (Cite)

CITE is a collaborative project between a number of organisations to provide an on-road test site for the connected information environment. This will allow the testing of wireless technology for Vehicle to Vehicle (V2V) communications and Vehicle to Infrastructure (V2I), collectively known as V2X. The extent of the CITE project is shown in Figure 8.13 below.

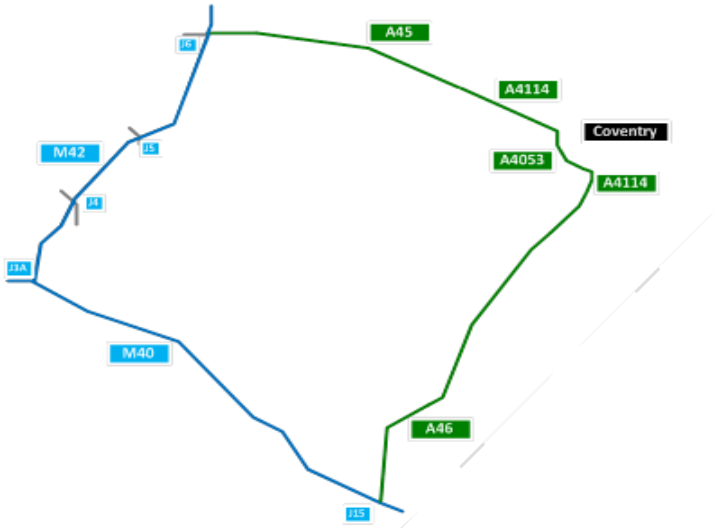


Figure 8-13 – Extent of CITE Project

8.5 Maintenance Repair Strategy Statement (MRSS)

The MRSS outlines key strategic design assumptions and decisions that have been taken during the design and construction of the project relating to the maintenance of assets within the scheme limits; it also provides high level statements demonstrating that a design for maintenance approach (IAN 69) has been taken during design of highways/structures/roadside assets and associated technology.

The M42 J6 Improvements scheme is currently at the Options Selection stage. Strategic technology and signing design assumptions have not been covered as part of this stage of the project. Consequently, the majority of the chapters within the MRSS are covered by status boxes which summarise specific areas that need to be detailed at the preliminary design phase of the project. .

The MRSS completed for this stage highlighted some scheme specific issues which include the proximity of the new southern junction to the existing Junction 6, the impact that the proposed MSA might have on the scheme, potential changes to hard shoulder running with the introduction of a new junction, and additional fencing required for protection to the GAA sports fields. It also considered some of the new assets to be maintained as a result of the improvement e.g. additional drainage infrastructure, new pavement surfacing, additional highway boundary fencing and additional retaining wall structures.

9 Summary of Environmental Assessment and Environmental Design

9.1 Environmental Assessment

The Environmental Assessment during PCF Stages 1 and 2 has been undertaken following methodology described in DMRB Volume 11 - Environmental Assessment and relevant Interim Advice Notes. Data has been gathered through desktop surveys and site walkover. Full methodological context is given for each discipline in the Environmental Assessment Report.

The work has been carried out based on available traffic data, although survey information is limited, further surveys will be undertaken during the preliminary design to provide a more detailed understanding of the area. However, this assessment provides a comparable understanding of the options, with enough detail to provide an understanding of the relative merits of the options considered. Whilst most assessments are uncertain with regards to the likelihood of significant effects, several environmental design measures and/or avoidance measures have been considered through the optioneering process to reduce these impacts and their significance.

All of the options considered for the Public Consultation have an adverse impact on the environment as they require a new route to be built from the new southern junction to Clock Interchange, through an 'open' landscape.

Options 1 and 2 will cut through a largely rural landscape, comprising a mixture of pasture and arable farmland, interspersed with small settlements. Travelling south to north, construction of the southern junction and south facing slip roads will affect Aspbury's Copse (Ancient Woodland and Local Wildlife site) before veering west through arable fields devoid of any sensitive environmental receptor.

The 2.4km Option 1 road alignment passes between the two Bickenhill Meadows SSSI sites. This alignment will potentially result in the relocation of the GAA sports fields - which is a private recreational facility of 'national' significance. As the alignment continues north, the proposed scheme continues past the west of Bickenhill, generally in cutting, before connecting to the A45 at the Clock Interchange. Option 1 will generally be unlit until it reaches Clock Interchange.

The 2.3km Option 2 road alignment passes to the east of Bickenhill and the two Bickenhill Meadows SSSI sites, initially in cutting to pass beneath Shadowbrook Lane before returning to existing levels and a short section of embankment. It then turns west into a deep cutting to pass beneath Church Lane, cutting through the centre of Bickenhill before connecting to a new lit roundabout in fields to the north of Bickenhill. A new lit dual carriageway will connect the roundabout to the A45 at the Clock Interchange.

The 1.6km Option 3 road alignment leaves the M42 approximately 1km north of Option 1 and 2, (just north of Shadowbrook lane). The alignment of the Southbound on slip will be on high embankment as it passes over the M42 and may need to be lit. The alignment then turns west into a deep cutting to pass beneath Church Lane, cutting through the centre of Bickenhill before connecting to a new lit roundabout in fields to the north of Bickenhill. A new lit dual carriageway will connect the roundabout to the A45 at the Clock Interchange.

All three of the options will likely impact upon the Noise and Air Quality sensitive receptors (mostly dwellings) either side of the proposed carriageway. Detailed environmental surveys are ongoing and assessment of these effects will be required as part of the submission for the DCO application.

To establish cumulative effects due to a combination of environmental disciplines, a process of identifying clusters or groups of receptors which experience multiple significant impacts was undertaken at a high level. This process can identify 'interactive effects', such as Air Quality and Biodiversity, and 'in combination' effects, such as those between the project and other projects. However, cumulative effects have not been used as part of the option selection.

The following is a high level discussion of the various effects the options could have, based on the information available at the end of the Options Phase of the project.

9.1.1 Air Quality

During construction, there is the potential for fugitive dust and particulate emissions from activities such as material loading and transfer onsite, construction of earthworks and track-out associated with heavy vehicles leaving the site with exposed disaggregate material. Construction vehicles accessing the site and non-road mobile machinery (NRMM) also have the potential to contribute to local ambient concentrations of NO_2 (nitrogen dioxides), PM_{10} and $PM_{2.5}$. (airborne particulate matter either smaller than 10µm or than 2.5µm).

Summary of Potential Effects

Construction Phase

There are a number of relevant sensitive receptors (e.g. dwellings, sports facilities / recreational areas etc.) located within 200m of each of the proposed options, which could be impacted by fugitive dust and particulate emissions. Although these activities would be localised and temporary in nature, the adoption of appropriate dust control measures should be specified in a Construction Environmental Management Plan (CEMP) specific to the proposed options to reduce the potential for significant construction impacts.

Given the volume of traffic currently utilising the M42 network, emissions of NO_2, PM_{10} and $PM_{2.5}$ from construction vehicles and NRMM are expected to add a negligible amount of additional pollutants within the context of existing background levels

Operational Phase

In the absence of traffic data and assessed road network, an indication of the potential impacts with regard to the operation of each design option was made qualitatively, with the number of sensitive receptors identified within 200m of each design option (see table below).

Proposed Option	Distance Banding Zone			
	0m – 50m	50m – 100m	100m – 200m	Total (0m – 200m)
Option 1	12	17	40	69
Option 2	12	23	29	64
Option 3	7	22	32	61

Table 9-1: Summary of relevant sensitive receptors within 200m of each proposed option

Each proposed option and variant considered has relevant sensitive receptors located within 200m of their respective road centreline.

This stage of assessment has identified that Option 1 will potentially impact the greatest number of sensitive receptors within the 200m boundary applied, a total of 69 receptors. Option 3 will potentially impact upon the least amount of considered receptors with a total of 61 positioned within 200m of the proposed option.

In addition, there lies uncertainty in relation to potential local air quality impacts with particular reference to NO_x concentrations and N-Deposition at the Bickenhill Meadows SSSI, Coleshill and Bannerly Pools SSSI and River Blythe SSSI.

The magnitude of the potential impacts experienced at the considered sensitive receptors is unknown at this stage of assessment. Potential air quality impacts will be identified and modelled in much more detail during the preliminary design of the scheme, and will be used to identify the mitigation which can be employed to minimise the effect on sensitive receptors.

Next stage assessment

Consideration will be given to the identified sensitive receptors that are within 200m of the preferred route to fully ascertain the significance of any air quality impacts, either adverse or beneficial. A technical note will be provided and the assessment will be carried out by employing the DMRB methodology, which may suggest that further detailed air quality assessment through dispersion modelling may be required.

Further consideration of the contribution of the preferred option with regard to regional emissions will be given and, if required, a regional assessment through the DMRB methodology will be undertaken to identify the effects of the scheme on the regional air quality. As the road network being assessed is not overly extensive, we would include all links in the regional assessment for completeness.

Given the lack of existing air quality monitoring within proximity to the proposed options, a six month NO_2 diffusion tube programme will need to be undertaken to provide localised air quality baseline data and to inform further assessment work, as per DMRB HA207/07 and Local Air Quality Management Technical Guidance (LAQM.TG(16)) guidance.

Any future assessment work undertaken during PCF Stage 3 may require further consultation with the relevant Environmental Health Officer (EHO) at SMBC to agree the appropriate level of any future assessment and to obtain updates to the following elements for inclusion within the assessment:

- Local Authority air quality monitoring data;
- Latest LAQM Review and Assessment reporting;
- Relevant receptor locations (including designated sites); and
- Other relevant sources such as Meteorological and Topographical information.

An assessment of the potential air quality impacts within the context of the existing Coleshill and Birmingham Air Quality Management Areas (AQMA) and emerging SMBC air quality policies may also be required.

9.1.2 Cultural Heritage

Assessment of the proposed options identifies the potential to impact upon both known and unknown elements of the historic environment. The proposed options will result in undesignated heritage assets being directly impacted upon, and designated heritage assets may be visually impacted upon (please refer to environmental constraint drawings in Appendix D).

Summary of Potential Effects

All three options would result in slight to moderate adverse impact upon archaeological remains and historic buildings, with Options 1 and 2 the most damaging of the three. Similarly, all three options would result in a moderate adverse effect on the historic landscape, with Options 1 and 2 the most damaging of the three.

The majority of the impacts would be moderate to major removing most if not all of the subsurface deposits at the sites, and the heritage assets have been assessed to be of high to negligible value. In addition, there exists a risk to previously unidentified archaeological remains. Mitigation measures are available which could reduce the magnitude of impacts to Cultural Heritage assets. However, uncertainty remains regarding likely significant adverse effects as the impacts are based on the proposed options without a site survey and mitigation measures. Therefore, this highlights the need for further survey and assessment work is required during PCF Stage 3 to resolve this.

Next stage assessment

A detailed assessment will be carried out in PCF Stage 3 for archaeological remains, historic buildings and historic landscapes. This assessment will be carried out in accordance with DMRB guidance for a detailed assessment and will include a

staged methodology for identifying impacts of the preferred option and measures required to mitigate likely significant adverse effects.

9.1.3 Landscape Effects

All options have the potential for adverse impacts on landscape character. All options have the potential for adverse visual impacts. However, the significance of potential impacts is still uncertain and, therefore, further surveys will be needed during PCF Stage 3 to develop the zone of visual influence.

Option 1

Option 1 is the longest option and influences the greatest extent of the study area. While set in deep cutting and minimising direct views of traffic its alignment passes through areas relatively free from major highways infrastructure and would give rise to significant visual effects across its length.

The significant visual effects arising from Option 1 would primarily arise from:

- The new junction on the M42 in the south which would introduce a new dumbbell arrangement, associated slip roads and lighting outside the existing M42 corridor to users of the rights of way and local roads;
- The offline link road, although set in deep cutting and passing to the west of Bickenhill, is extensive and would be in close proximity to several rights of way as well as residential properties; and
- Modifications to the local road network, including the addition of new roundabouts.

Option 2

Option 2 would primarily influence the study area to the west of the existing M42 corridor. Despite the existing visual influence of the motorway on this area this option would still result in significant visual effects.

The significant visual effects arising from Option 2 would primarily arise from:

- The new junction on the M42 in the south which would introduce a new dumbbell arrangement, associated slip roads and lighting outside the existing M42 corridor to users of the rights of way and local roads;
- Significant earthworks within the rural landscape to the east of Bickenhill separating the village from the M42, increasing the existing views of traffic and reducing the separation of the village from the M42 corridor in views from Bickenhill and for users of the public rights of way;
- The new link road passing in cutting to the east of the village core, resulting in the loss of existing houses and existing mature vegetation and introducing nearby views of traffic movements for residents in Bickenhill; and
- The new roundabout junction to the north of Bickenhill deteriorating the separation of the village from the A45 and introducing a new lit roundabout and prominent views of traffic for residents in Bickenhill and users of the public right of way.

Option 3

Option 3 is the shortest option and would overall influence the least amount of the study area, however it would give rise to a relatively high number of significant effects at the upper end of the scale which are unlikely to reduce once mitigation has established.

The significant visual effects arising from Option 3 would primarily arise from:

- The southbound link road crossing over the M42 on high embankment to the east of Bickenhill. The major earthworks would restrict views, introduce high level traffic movements and significantly increase the prominence of the M42 in views from Bickenhill and for users of the public rights of way to the north and east of the village;
- The new link road passing in cutting to the east of the village core, resulting in the loss of existing mature vegetation and introducing nearby views of traffic movements for residents in Bickenhill; and
- The new roundabout junction to the north of Bickenhill deteriorating the separation of the village from the A45 and introducing a new lit roundabout and prominent views of traffic for residents in Bickenhill and users of the public right of way.

Summary of Potential Effects

The landscape effects for each option can be summarised as follows:

- Option 1 would result in a moderate adverse effect to Landscape Character Assessment (LCA) 1 and neutral effects to LCA 2 and LCA 3.
- Option 2 would result in a moderate adverse effect to LCA 1 and neutral effects to LCA 2 and LCA 3.
- Option 3 would result in a slight adverse effect to LCA 1 and neutral effects to LCA 2 and LCA 3.

The assessment has found that Option 3 would not give rise to significant adverse effects to the surrounding landscape character, while the more extensive Options 1 and 2 would give rise to significant adverse effects. The significant visual effects for each option is summarised below.

	Option 1	Option 2	Option 3
Significant Effects in Year of Opening	7	6	5
Significant Effects in Design Year	5	5	5

Table 9-2: Summary of significant visual effects

The assessment has identified that Options 1 and 2 affect a greater extent of the study area and initially give rise to a greater number of significant visual effects.

Once mitigation measures have established the number of significant effects for Options 1 and 2 would be reduced, whereas the number of significant adverse visual effects for Option 3 would remain suggesting that there is less scope to integrate this

option within views. Overall each option is likely to result in significant adverse visual effects that cannot be mitigated.

However in principle the following mitigation measures should be implemented for any option in order to avoid or reduce potentially significant effects:

- Minimise works area to retain existing roadside vegetation that currently provides screening;
- Reinstate roadside vegetation where possible using appropriate native species;
- Targeted screen planting where appropriate to mitigate potentially significant impacts;
- Use of appropriate surfaces and finishes to structures; and
- Tie into existing vegetation to provide local connectivity.

Next stage assessment

A detailed landscape and visual impact assessment will be required to fully understand the potential visual effects of any preferred option.

Development of a detailed landscape design to reduce and mitigate potential impacts to both landscape character and visual receptors will also be required.

In addition to mitigating potential impacts to visual receptors there are potential opportunities to include measures within the landscape design, during PCF Stage 3, which could provide enhancements to existing ecological conditions and meet the requirements of integrating the design into the existing landscape.

9.1.4 Nature Conservation and Biodiversity

Summary of Potential Effects

There are a number of statutory and non-statutory sites in the study area including three SSSIs. Each option will impact a different combination of these sites and potentially European protected species (see the table below). Whilst the significance of the effects is uncertain pending further surveys and assessment; avoidance measures have been considered for Option 1 so as to reduce the likelihood of impact on the Bickenhill Meadows SSSI.

Next stage assessment

A detailed assessment in accordance with DMRB will be required during PCF Stage 3 and will be informed by the following proposed surveys and assessment of the findings.

Designated Sites

The impact on Bickenhill Meadows SSSI, River Blythe SSSI, Coleshill and Bannerly Pools SSSI, Aspbury's Coppice Ancient Woodland/LWS/Ecosite, Castle Hill Farm Meadows LWS, Greens Ward Piece Ecosite, Bickenhill Churchyard Ecosite, Meadows to the east of the Jungle Ecosite, Clock Lane Meadows Ecosite, Hollywell Brook LWS/Ecosite, Wayside Cottage Ecosite, and Roadside Hedge Ecosite is at

present unknown as the proposed options are at an early stage of design, but are likely to involve both direct and indirect impacts. Botanical surveys (such as NVC) will assist in determining the baseline ecology of these sites. Further analysis of the preferred option design (in particular the drainage designs and proposed construction methods during PCF Stage 3) will be undertaken to inform the determination of likely significance of effects.

Consultation with Natural England and SMBC will be undertaken to develop an understanding of the value and importance of all sites which would be impacted by land-take and to develop appropriate compensation measures and to discuss opportunities to enhance the ecological environment.

Important hedgerows

A survey of hedgerows which may be affected by the proposed options will assist in determining if any important hedgerows are present, which will provide a baseline ecology for mitigation and compensation design.

Bats

Further surveys are required to determine the presence of bat roosts and the use of landscape features within proximity to the proposed options.

A preliminary roost assessment will be undertaken prior to an internal and external inspection (including an endoscope survey of accessible crevices) of roost features in both trees and structures.

Depending on the outcome of the survey, further emergence/re-entry surveys may be required to inform more accurately the presence, species, numbers of bats present and type of roost.

Bat activity and transect surveys will help determine the importance of features such as hedgerows and grasslands which may be directly impacted by the proposed options. The survey should focus on sections of hedgerow, woodland and foraging areas outlined for removal or land take. These surveys may take the form of walked transects or by the deployment of static detectors.

These surveys will be undertaken during the bat active season, March to October.

Great Crested Newt and other Amphibians

Habitat Suitability Index (HSI) surveys have been undertaken of all accessible ponds within 500m. Presence/absence and population size assessment surveys (as required) will be undertaken on all accessible ponds identified as being suitable to support breeding great crested newts. If the presence of great crested newts is confirmed, an assessment of the terrestrial habitat should be undertaken to determine the impact to hibernation and foraging areas lost to the proposed options.

Otter and water vole

Watercourses within the study area will be surveyed for otter and water vole to collect population information and determine the importance of these habitats for

these species and plan appropriate mitigation. These surveys should be undertaken during the active season, April to September.

Dormouse

Surveys for dormouse will be undertaken. These will comprise nest tubes, deployed in hedgerows and woodland outlined for removal, and should be checked on a monthly basis throughout the dormouse active season, April to November.

Reptiles

Reptiles' surveys will be undertaken. These will comprise placement of refugia within suitable habitats outlined for removal, with transect checks undertaken during the reptile active season April to October, with peak months of April, May, June and September.

Invertebrates

Invertebrates' surveys will be undertaken, focussing on habitats such as habitats including scrub, grasslands, woodland and field margins which may support important assemblages of invertebrates and are outlined for removal under the current route options.

Identification of Site Specific Mitigation Measures

On completion of the above surveys, site specific mitigation measures will be developed and included in the emerging design to mitigate potential impacts and reduce the likelihood of significant and adverse effects on ecological receptors.

Opportunities for Enhancement

There are potential opportunities to include measures within the design which could provide enhancements to existing ecological conditions. These could include replacement grassland, scrub and woodland to create a linked matrix of new habitat with increased species diversity and structure. This would be undertaken with reference to the provision for enhancement identified in Outcomes 2 and 4 of the Highways England Biodiversity Action Plan (BAP).

9.1.5 Noise and Vibration

With limited traffic data available at the time, it has not been possible to conduct quantitative noise modelling during PCF Stage 1 and 2. An assessment has been carried out including the identification of sensitive receptors within 600m of the proposed options. Mitigation may include the use of noise barriers / earth bunds to screen the receptors from the road. However, further noise modelling is required to understand if significant effects are likely.

Opportunities for Enhancement

There are potential opportunities to include measures within the design which could provide enhancements to existing ecological conditions. These could include replacement grassland, scrub and woodland to create a linked matrix of new habitat with increased species diversity and structure. This would be undertaken with reference to the provision for enhancement identified in Outcomes 2 and 4 of the Highways England BAP.

Summary of Potential Effects

Construction Phase

At the time of the assessment information on the types of plant and equipment, phasing, working times, traffic management measures, method of piling and plant set up/combination had not been specified. Therefore, it is assumed that receptors within 200m of the construction areas may experience temporary adverse impacts associated with, but not limited to, the following:

- Piling;
- Percussive drilling;
- Demolition of structures;
- Operation of generators;
- Operation of other heavy machinery;
- Haulage of material; and
- Night-time working.

Operational Phase

At this preliminary stage of assessment, calculations of road traffic noise using predicted traffic flows have not been undertaken. As an indication of the potential for the number of receptors which may experience operational noise impacts, a proximity count exercise has been undertaken using geographic information system (GIS) software. The number of dwellings and other relevant noise sensitive receptors within distance bands of each of the proposed options are presented in Table 9-3 and 9-4 respectively.

Proposed Options	Banding Zone				
	0 – 50m	50 – 100m	100 – 200m	200 – 300m	300 – 600m
Option 1	12	11	38	31	115
Option 2	8	11	36	31	61
Option 3	3	9	38	13	79

Table 9-3: Dwelling receptor counts

Proposed Options	Banding Zone				
	0 – 50m	50 – 100m	100 – 200m	200 – 300m	300 – 600m
Option 1	2	2	1	2	3
Option 2	2	2	2	0	3
Option 3	1	1	3	1	3

Table 9-4: Other noise sensitive receptor counts

The residential areas in closest proximity and potentially adversely impacted at Junction 6 of the M42 are to the south east of the junction on Old Station Road. There are also a number of isolated dwellings and farms to the north east of the junction and north of the A45, which could also potentially be adversely impacted.

The closest other sensitive receptors to Junction 6 are St Peters Church and Church Hall, on Church Lane, Bickenhill, which are approximately 670m from the M42 carriageway and 550m from the A45.

Next stage assessment

It is recommended that noise surveys are undertaken at sample noise relevant sensitive receptors along the length of the proposed options in order to inform a more detailed construction noise assessment, to be completed in accordance with BS 5228, including setting noise thresholds to limit impacts during the works.

During PCF Stage 3 a screening exercise will be undertaken to understand how the changes in traffic, as a result of the proposed options, could potentially impact relevant sensitive receptors. The screening exercise should also inform discussions in relation to the potential inclusion of mitigation measures (such as acoustic fencing or low noise surfacing) in areas of particular concern if the potential for adverse impacts is identified.

Furthermore and during PCF Stage 3, a detailed quantitative assessment of the operational noise impacts will be undertaken in accordance with the DMRB methodology. An assessment of the construction effect will also be undertaken, and the Environmental Health Officer at SMBC will be consulted to agree the parameters that could be used during construction, i.e. working hours / location of haul routes etc.

9.1.6 Geology and Soils

Summary of potential effects

The desk based assessment indicated that there are no designated geological sites within 1km of the study area but there are 15 potentially contaminated sites. Earthwork cuttings and structure foundations will impact local soil and geology, although significant adverse effects are considered to be unlikely.

Superficial Geology

The proposed options are likely to have permanent adverse impacts due to the removal of superficial geology outside of the highways boundary. The magnitude of impact will be influenced by the depth of cut required to install new infrastructure.

Bedrock Geology

The proposed options are likely to have adverse impacts on bedrock geology if intrusive construction measures such as piling or percussive drilling is required to install new structures or infrastructure.

Soils

The proposed options are likely to have permanent adverse impacts on soils and agricultural land due to land take outside of the highways boundary.

Contaminated Land

Disturbance of the 12 identified sites identified in the area of the proposed options, particularly through excavation, could result in adverse impacts due to the exposure of receptors to potentially harmful contaminants.

To illustrate the potential risk of disturbing contaminated sites a simple source-pathway-receptor model for the commercial and household waste tip opposite Church Farm follows:

- source: Industrial, commercial and household waste tip opposite Church Farm;
- pathway: ingestion, inhalation, touch or movement of potentially contaminated material which would be most likely to occur during ground clearance, earthworks and excavations;
- receptors: construction workers, residents of the nearby houses or ecological receptors such as Kinghurst Brook / Low Brook, headwaters & Tributaries Eco Sites.

In relation to which option poses the greatest risk of opening up a pathway without a targeted ground investigation it is not possible to determine at this stage. However a comparison of options is given below:

- Options 1 and 2 have long lengths of new road in cutting which impinge over very short sections onto areas of land identified as landfill sites (see features 2 and 4 on the Geohazard Plan in Appendix D)
- The underlying ground conditions are predominantly mudstone which is overlain in places by superficial deposits comprising Alluvium and Fluvioglacial Sand and Gravel. An area of Alluvium underlies the location of the proposed new southern Junction for Options 1 and 2. Such deposits are likely to be soft/loose and/or compressible.
- Option 3 has more embankment/fill areas than the other options, it coincides with a minor defect in an existing embankment and there is also a small area of alluvium underlying the proposed route which likely to be soft/loose and/or compressible.

At the time of assessment there was limited information regarding the risks relating to the potentially contaminated sites and therefore it was not possible to rule out likely significant adverse effects.

Next stage assessment

Further consultation with SMBC local geological groups and the British Geological Survey (BGS) will help identify any local sites of geological interest.

A detailed Ground Investigation will be undertaken during preliminary design to identify the potential for poor ground conditions including areas of contamination, which could be mobilised or displaced during construction, and gain a detailed understanding of the ground conditions and hydrology of the area to enable the preliminary design and avoid or mitigate potential problems.

A more detailed assessment will be undertaken during the next stage including further details on construction techniques and utilising the results of the planned geotechnical investigation.

9.1.7 Materials

Summary of potential effects

Given the scale of the proposed works outside of the highways boundary for the proposed options, the range of potential mitigation measures and the potential capacity of waste treatment options available, there is a low likelihood of having a significant adverse effects on materials resource or the use of waste capacity in SMBC. The suitability for site won material to be reused as fill will be assessed as part of the ground investigation during preliminary design.

Quantities of earthworks cut and fill volumes will become available during the next stage. However, an early assessment of the options has identified:

- **Option 1 and 2:** As these options are predominantly in cutting there is likely to be an excess of site won material. The assessment considered material resources, waste and opportunities for re-use on site (potentially as earth bunding). The conclusions are that there is a low likelihood of there being significant adverse effects on local materials resource or SMBC waste capacity;
- **Option 3:** There is a mixture of cutting and embankment and, consequently, there would be less site won material. The conclusions are that there is a low likelihood of there being significant adverse effects on local materials resource or SMBC waste capacity.

Next stage assessment

A further assessment, in accordance with IAN 153/11, will be undertaken once the preliminary design has established the outline cut and fill balances and a book of quantities are developed for the preferred option. A further assessment to identify potential waste streams and sites and capacities within SMBC will be undertaken in the next stage.

9.1.8 People and Communities

Summary of potential effects

This assessment has considered the impact on vehicle users, NMUs, land use and amenity. All options are beneficial for drivers but are likely to impact on NMUs and land use due mainly to land take, severance and consequential loss of amenity. Option 1 potentially results in loss and severance of one or more of the GAA sports fields, and Option 2 and 3 run through Bickenhill. Preliminary design will include liaising with the affected property owners, local residents, the public and other stakeholders to understand the full impacts the preferred route will have.

Non-Motorised Users

Option 1

Without mitigation, moderate to substantial adverse impacts are anticipated where Option 1 severs seven Public Right of Way (PRoW).

It is likely that the amenity value of these footpaths will be substantially altered due to the introduction of new infrastructure into the landscape.

A cycle route, which links Solihull and the airport, NEC and future HS2 terminal will not be directly impacted by this option although the introduction of traffic could lead to adverse impacts on the amenity of this route.

Option 2 and 3

Without mitigation moderate to substantial adverse impacts are likely on 3 PRoW's , located to the east of Bickenhill, being intersected by the new alignment(s).

It is likely that the amenity value of these footpaths will be substantially altered due to the introduction of new infrastructure into the landscape without adequate mitigation.

View from the Road

Option 1

The proposed option is aligned to the west of Bickenhill before connecting into the existing A45. Vehicle travellers will receive glimpses of largely flat agricultural landscape and associated farm buildings. Nearer to Bickenhill the view to the east will comprise of cutting slopes, the village, farms and residential property interspersed in the agricultural landscape.

Option 2 and 3

Vehicle drivers are likely to benefit from intermittent views of the flat agricultural and rural landscape and village of Bickenhill. Re-routing the road northwest away from the M42 east of Bickenhill will likely improve the visual attractiveness of the driver's journeys. This is likely to have a moderate beneficial impact on view from the proposed road.

Vehicle Users

Motorised users are anticipated to receive beneficial impacts from all options as speeds will increase resulting in less frustrating driving conditions. Signage and street furniture will be installed to present standards resulting in improved directional awareness and improved safety.

Community Land

Option 1, 2 and 3

This assessment found that there is no direct impact to community land will occur as a result of proposed Options 1, 2 and 3.

Commercial, Agricultural and Residential Land

Commercial Land

Option 1

Without mitigation the GAA sports fields and facilities located adjacent to Catherine-de-Barnes Lane will be subject to permanent, substantial adverse impacts as a result of the Option 1, to the extent that the proposed option is likely to preclude continued operation of this recreational area for its existing and intended use due to land-take and loss of amenity. The fields are considered to be of national importance to the sport. Discussions are ongoing with the GAA in order to get agreement for potential replacement fields in the vicinity in order to mitigate loss of existing fields.

Option 2

Option 2 would lead to the loss of land to a set of Bickenhill stables, to the extent that this business may have to close.

All Options

None of the proposed options will have direct impacts upon other commercial property. However, Birmingham Dogs Home, Bracey's Nursery and The Haven Caravan Park, all located on Catherine de Barnes Lane, will be indirectly impacted by all three options.

Agricultural Land

All three options will impact agricultural land to varying degrees, causing land-take and severance to several plots. Whilst agricultural land impacted by the proposed options was graded under the Provisional Land Classification (1956) it was not subsequently graded by the standard Agricultural Land Classification (ALC, 1988). This indicates that none of it was deemed of high enough quality. Therefore, the developments would not cause significant adverse impacts to high grade agricultural land.

Residential Land

Option 1 does not directly impact any private properties. Option 1B directly impacts one property.

Option 2 and 3 each directly impact three properties. Options 2 and 3 would also have a significant indirect impact on all properties to the north of the village, as these options bisect Bickenhill, cutting 12 properties off from the village centre.

All options will impact a local caravan park adjacent to the A45.

Mitigation measures will be identified following further consultation with SMBC, land owners, Parish Councils and community groups as the preliminary design is developed.

Development Land

The study area is part of the Meriden Gap green belt, and national and local policy do not support the provision of new development in this area. The proposed options do not physically impact development land but could have a permanent and beneficial impact on land associated with future development associated with Birmingham Airport, JLR, HS2, and Birmingham Business Park by improving journey times to these areas from the M42 and A45.

Extra have applied for planning permission from SMBC for a new MSA near Solihull Road Bridge. Option 3 would not facilitate this MSA, as their links to the motorway would conflict with the south facing slips planned for that option. However, the MSA planning application would be unaffected by Options 1 and 2.

The National Planning Policy Framework (NPPF) states that nationally important transport infrastructure, can notably be considered as an 'appropriate' development in the green belt, providing a compelling case can be made to enable the infrastructure development to proceed in this area.

Next stage assessment

During the next stage, consultations will be undertaken with affected asset owners in order to develop a detailed assessment of potential effects. The consultations will adhere to following process:

- The preliminary design will enable improved identification of community, agricultural and commercial holdings which will be directly affected by the preferred route; a further screening exercise to identify the likely level of impact on the agricultural and commercial businesses to recognise any requirements for additional information or site visits;
- evaluation of a preferred option to establish the potential impact on landowners' agricultural businesses and identify appropriate design and mitigation measures;
- consultation with land owners / tenants or / and land agents who are identified as likely to be directly affected by the preferred option, in order to discuss mitigation or potential purchase;
- identification and agreement of accommodation works and mitigation which could be applied in order to reduce the effect of the scheme on directly and indirectly affected parties; and
- assessment of the significance of residual impacts on community land and facilities, including agreed mitigation.

9.1.9 Road Drainage and the Water Environment

Summary of Potential Effects

The desk based study shows that there are no ground water protection zones and that the main water feature in the study area is the River Blythe. There are challenges associated with the potential impacts of all three options in relation to increased road run off. Further drainage design including a flood risk assessment will be required in the next stage.

Assessment of the proposed options indicates that there is uncertainty over whether significant effects are likely in relation to pollution from routine runoff and flood risk, due to the complexity of the proposed options and the absence of a drainage design and flood risk strategy. In relation to all other potential impacts, there is a high degree of certainty that there is a low likelihood of significant effects, assuming that

good practice design measures as outlined in the mitigation section are embedded within the chosen scheme option design.

Next stage assessment

Further work will be required following the preliminary design, which will enable a clearer understanding of the proposed drainage design, allowing the assessment of the location of outfalls; in relation to local watercourses to determine any impacts of any potential discharges to surface water based on the latest drainage design, with identification and evaluation of appropriate treatment techniques. This will comprise of a DMRB HD 45/09 'Method A' assessment to assess the impact of routine runoff on local watercourses. The potential for accidental spillages within drainage networks to cause an impact on receiving waterbodies will be assessed following DMRB HD 45/09 'Method D'.

Given the increase in impermeable areas for all proposed options and the potential impacts from increased flood risk it is recommended that a Flood Risk Assessment, in accordance with DMRB, is undertaken to understand the potential issues in relation to, and the need for attenuation. It is recommended that a Flood Risk Assessment is undertaken during the next stage as part of the preliminary drainage design and that suitable mitigation is implemented to address any risks identified.

Further data on local abstractions and private water supplies within the proposed options area will be sought to determine the level of impact on these supplies.

Consultation will be carried out with local sewerage authorities where any highways discharges are planned into the sewer network, where DMRB assessments do not apply, to determine the impact on water quality of existing sewage flows. Consideration will also be required in relation to the assessment of water quality impacts where proposed road drainage will tie into existing networks, which may be currently below standard.

Consultation with both the local authority and EA for further data on both private and public water supplies within the area will allow a more detailed assessment to take place.

There is an opportunity to address any existing water quality or flooding issues for this section of the strategic and local road network or to upgrade to current standards.

9.2 Consideration of Alternatives

9.2.1 PCF Stage 1 (Option Identification)

Forty options were identified at the beginning of PCF Stage 1. These were reduced to five general themes through the use of an Early Assessment Sifting Tool (EAST), in order to enable a more detailed assessment. The routes were categorised into the following:

- North and South Junction;
- South Junction;

- Interchange;
- North Junction; and
- Comprehensive upgrade to the existing Junction 6.

These detailed assessments identified that the only viable option was a Southern Junction option, incorporating some of the elements of the comprehensive upgrade to Junction 6. Three variants of this option were identified and taken to the Public Consultation.

A more detailed description of this exercise is outlined in the Technical Appraisal Report (TAR)

9.2.2 PCF Stage 2 (Option Selection)

Following the Public Consultation, additional stakeholder consultations were undertaken to follow up on the concerns and issues raised by a number of parties including the CPRE, GAA and SMBC which influenced the final route selection.

The project team has considered adjustments to the specific routing of Option 1. This was prompted as a result of these additional discussions, which identified the GAA sports fields as assets of importance at a national level.

Option 1B provides the best compromise, as it reduces the impact of Option 1 on the GAA sports fields. However, it moves the alignment slightly closer to Bickenhill and, due to the nature of the assessment methods used in this stage, the minor alteration to Option 1B will have no impact on the assessments for Option 1. As the preliminary design progresses, a more detailed assessment will be carried out in order to determine the likely effects of this option on Bickenhill. However, Option 1B will have a direct effect on one property.

10 Summary of Public Consultation

Highways England held a 7 week non-statutory consultation exercise for the M42 Junction 6 Improvement scheme between Friday 9 December 2016 and Friday 27 January 2017. The consultation aimed to present the scheme to stakeholders, constituent residents and the public, informing them about the option assessment process and to gain feedback on the options developed.

A consultation brochure was produced and made available at local libraries and at the consultation exhibitions. A questionnaire was included in the brochure and was available to complete online via a link from the Highways England scheme webpage**.** Eight exhibitions and one webchat were organised during the consultation. (www.highways.gov.uk/m42-j6).

The events were promoted via local media, social media, letters to local residents, posters at key locations and through third party communications channels. In total 298 people visited the exhibitions although no attendance registers were used at the NEC events.

A total of 217 responses were received during the consultation period. 84% of these were completed questionnaires and 16% were responses as letters or emails.

The feedback received from the consultation was used to inform the further development of the assessment and design process leading to a recommendation on which route option to take forward.

The Report on Public Consultation presents a full summary of how stakeholders were informed of the consultation events, how the options identified were presented, the responses received and initial analysis of the consultation responses.

10.1 Presented Options

Three options were presented at the consultation together with the optional free-flow left turns at junction 6.

These were:

- Option 1 – Link to the west of Bickenhill (2.4 km of new dual carriageway)
- Option 2 – Link to the east of Bickenhill (2.3 km of new dual carriageway)
- Option 3 – Link to the east of Bickenhill, with south facing slips onto the M42 (1.6km of new dual carriageway)

Details were also provided on some of the options which had been considered as part of the options development process, but were subsequently discounted.

10.2 Consultees

Extensive stakeholder mapping took place to identify those who may have an interest in or be affected by the scheme, in order to ensure a fair and representative consultation.

This mapping forms part of Highways England's commitment to engage with stakeholders. The project team had involved key stakeholders in the process of developing appropriate options to take forward to the public consultation. The project team will continue to maintain close links with all the stakeholders as the scheme develops through the preliminary design and statutory process; in order to ensure their views and issues are incorporated into the design where appropriate.

Letters inviting stakeholders to the consultation events were sent to 1809 local residents and businesses within the consultation boundary, 210 landowners and occupiers identified as having an interest affected by the proposed options and 47 key organisations, businesses and community groups. In addition, 32 letters were sent to VIPs inviting them to the public consultation preview session. Additional publicity was also undertaken to highlight the consultation events to stakeholders.

Many of those contacted were the same consultees as outlined in section 42 of the Planning Act 2008, specifically local authorities and those with an interest in affected land.

The consultees can be broken down into the groups listed below:

i) **Local community**:
- All address points within 100m from the proposed options. 100m is the standard distance away from a project for which the local community should be notified.
- In addition to the limited cordon defined above, all address points in Catherine-de-Barnes, Hampton in Arden, Bickenhill and Birmingham Business Park were included as 'Local community'. On review it was felt the project would be of interest to residents in these locations, these were therefore added to the consultation area.

The consultation boundary resulted in the inclusion of approximately 1,800 address points/letters.

ii) **Landowners**: Those parties identified through land referencing processes as land owners and occupiers of land within the vicinity of the proposed options whose land may be affected by the scheme.

iii) **Key community and business stakeholders**: Through discussions with the local authorities, a full list of stakeholders was created. This included:
- Parish Councils;
- Politicians including Members of Parliament, Members of the European Parliament and local councillors;

- Key businesses and business groups;
- Community groups.

Highways England worked with the local authorities to identify hard to reach groups to help ensure the consultation was inclusive. Long distance motorway users were identified as a group which required communications to inform about the consultation.

10.3 The consultation

Eight exhibitions and one webchat were organised during the 7 week consultation. The exhibitions took place on a range of dates, times and locations in order to capture a wide range of stakeholders. The locations included the NEC (two days at the Ladies Kennel Association show and one day at North Avenue), Arden Hotel Catherine de Barnes Village Hall, Hampton in Arden Village Hall, Touchwood Shopping Centre (Solihull) and St Peters Church Hall (Bickenhill).

The public consultation also included information on the Highways England website, including access to electronic copies of all of the presentation boards, brochure and the questionnaire; this included a monitored inbox to enable viewers to ask questions if desired.

10.4 Results

In total, 217 responses were received during the consultation period. 84% of these were completed questionnaires and 16% were responses as letters or emails.

Response channel	Total number
Questionnaire returned at exhibitions	52
Questionnaire returned by post	17
Questionnaire completed online	113*
Respondents who did not use the questionnaire	35*

Fig 10.1 Questionnaire Responses

*The comments from one online questionnaire response were also submitted as an email response. The issues raised were therefore only accounted for once.

35 stakeholders chose to submit letters or emails to present their consultation feedback. The majority of these were from businesses or community groups. Many of the major businesses, which had been engaged with by the project through stakeholder meetings, submitted letters as their consultation response and included their support for the project and their objection to option 3 as it would have a severe impact on their medium/ long term aspirations.

The results showed 71% agreed or strongly agreed the M42 junction 6 needs improving. 16% strongly disagreed or disagreed the junction needs improving and 13% neither agreed nor disagreed.

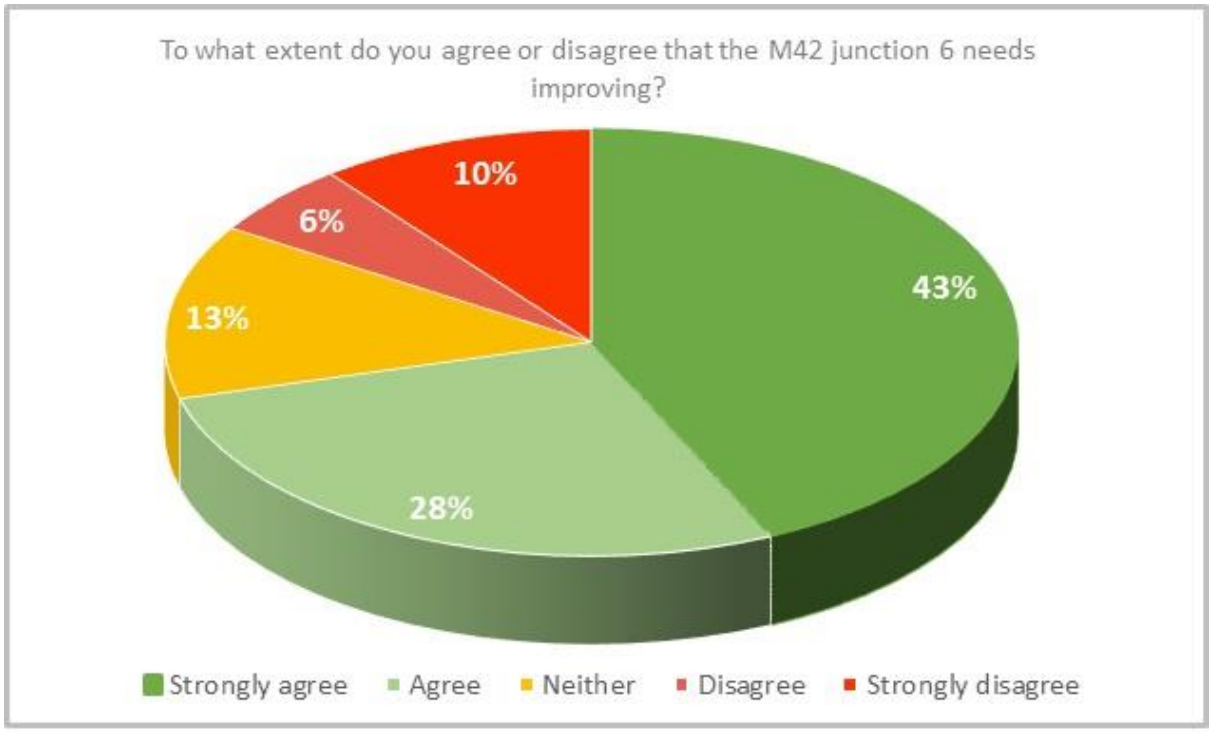


Fig 10.2 Results Summary

The consultation showed that 64% of the total responses preferred Option 1 with 15% preferring Option 3 and 10% preferring Option 2. 11% had no preference.

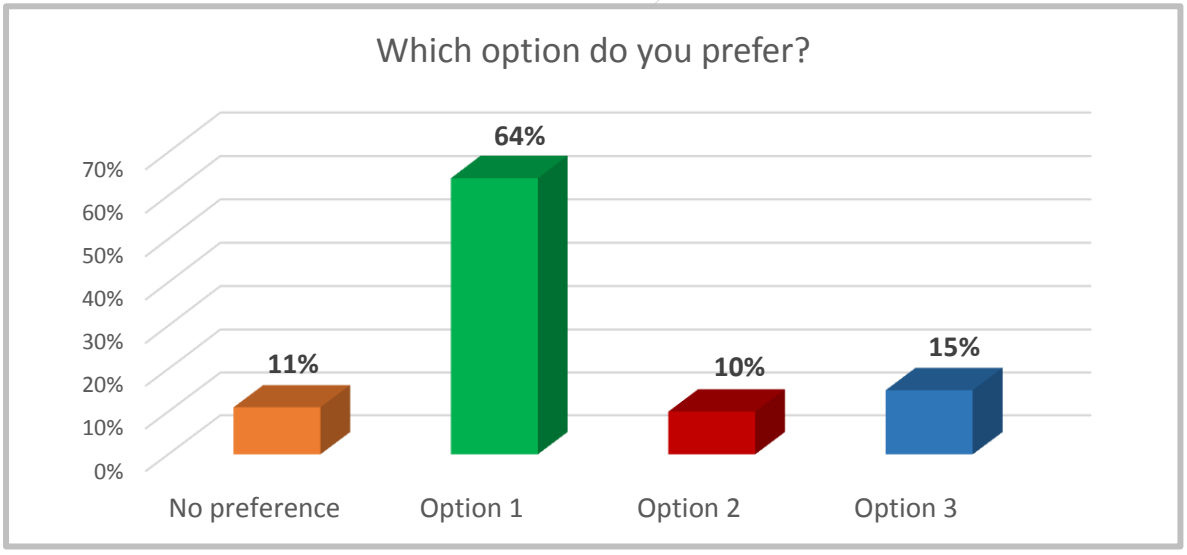


Fig 10.3 Preference of Options

For the 67% of responses where demographic information was provided the option selection has been broken down further, as shown in the graph below. These responses indicated that Option 1 was the preferred option for those within and outside the consultation boundary and key businesses and organisations. Option 3 was the next best supported preference for those within the consultation boundary and Options 2 was preferred for those outside the consultation boundary.

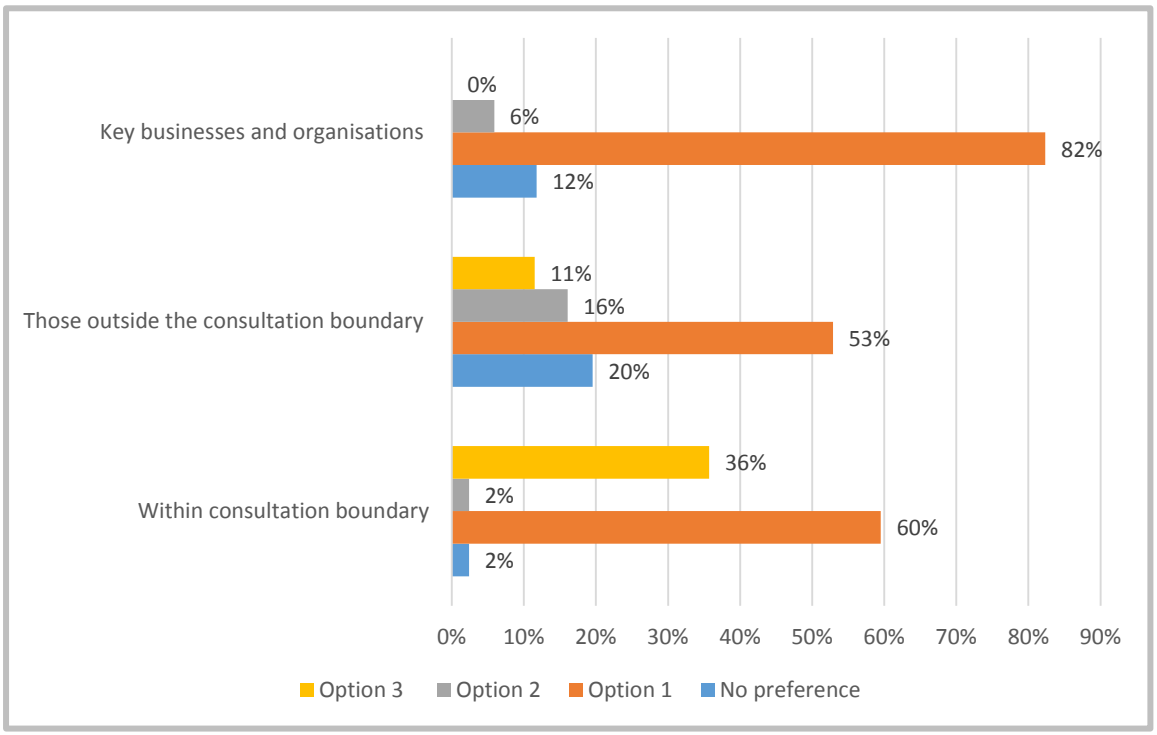


Fig 10.4 responses with demographic information

The consultation did not specifically include a question on the free-flow links but many stakeholders included their thoughts in the open comment boxes or in their letters. Overall 31 comments were received on the free-flow links. The graph below shows the breakdown of these by sentiment.

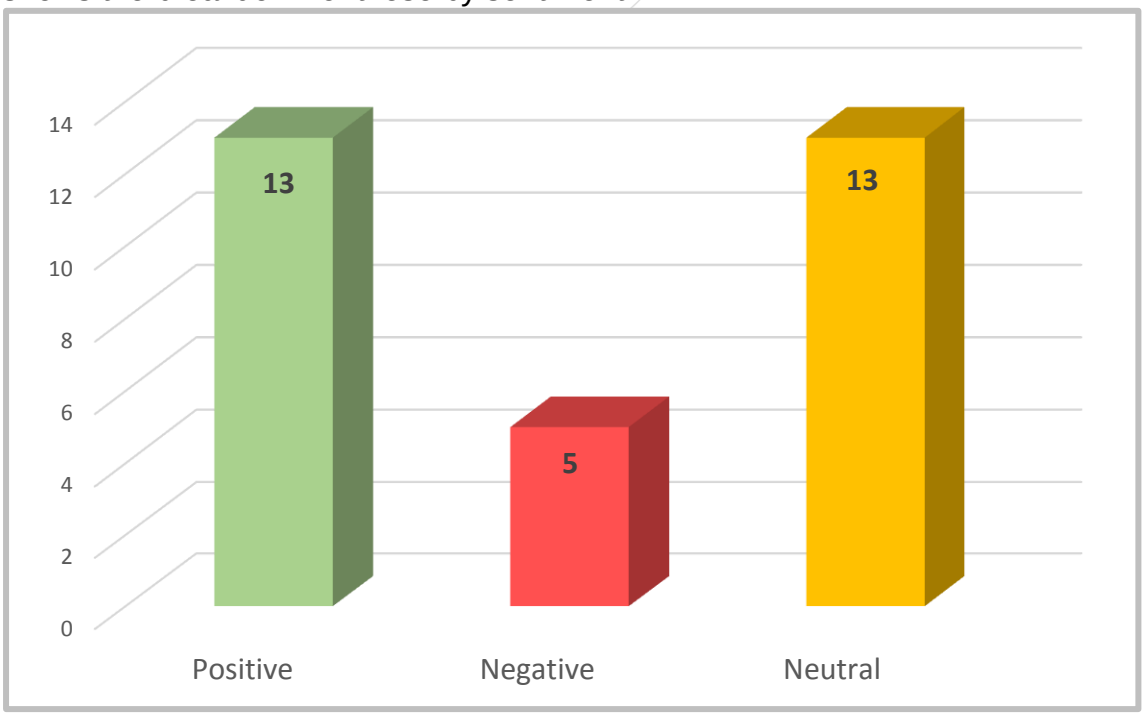


Fig 10.5 Responses on Free-Flow Links

The majority of these were either positive or neutral comments. The majority of positive comments stated that the free flow left turns should not be an optional extra but should be an integral part of the scheme.

A number of respondents suggested changes and alternatives to the possible options presented at the consultation. An examination of the alternative design suggestions concluded that all of the suggestions had been previously assessed and taken into account as part of the work during the option selection process, or were not within the remit of the project.

Some of the suggestions put forward by respondents identified alterations to the detail of the proposed options, which will be considered in the next stage of the design process, in particular:

- Clock interchange potential changes
- Free flow links at M42 Junction 6
- Facilities for non-motorised users

10.5 Next steps

The next step for the project is the Preferred Route Announcement, which will be published alongside the Report on Public Consultation.

Highways England will continue to engage with all the stakeholders as the scheme develops through the preliminary design and statutory process; in order to ensure their views and issues are incorporated into the design where appropriate.

The scheme is classed as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008. As such, Highways England will develop an application for a Development Consent Order (DCO) in order to construct the scheme. The application will be made to the Planning Inspectorate (PINS), who will examine the application in public hearings and then make a recommendation to the Secretary of State for Transport, who will decide on whether or not the scheme will go ahead.

Prior to the application for the DCO, Highways England will undertake a statutory public consultation identifying the preferred route in more detail, including more detailed assessment of its effects on the locale. This is currently planned for late 2017 or early 2018.

Details of the statutory consultation will be set out in the Statement of Community Consultation (SoCC) which will be prepared and published in accordance with Section 47 of the Planning Act 2008 and consulted with the Local Authorities.

A Consultation Report will be created and will form part of the application for the DCO under section 37 of the 2008 Act and will draw together:

- an account of the statutory consultation, publicity, deadlines set, and community consultation activities undertaken by the applicant at the pre-application stage under s42, s47 and s48
- A summary of the relevant responses to consultation; and
- The account taken of responses in developing the application from proposed to final form, as required by s49(2).

It is expected the formal DCO application will be made in mid-2018 and the programme to start works is scheduled to begin in March 2020.

11 Appraisal Summary Table

11.1 Appraisal Summary Tables (ASTs)

The AST provides a mechanism to succinctly review the above assessments in order to objectively compare the options across a range of impacts which include economic, environmental, and social and effect on the public accounts.

For all options the likely effects in relation to the items below have not yet been fully quantified:

- Air Quality;
- Cultural Heritage;
- Visual Receptors;
- Biodiversity;
- Noise;
- Communities and People; and
- Road Drainage and the Water Environment.

Consequently the AST includes a qualitative description of the type of impact expected. These elements will be investigated further following Preliminary Design when an environmental assessment can be made on these effects.

Copies of the AST for the consultation options are attached in Appendix G

12 Conclusions and the Recommended Route

12.1 The Business Case

There is a strong strategic case for this scheme to improve a junction which is predicted to be working above capacity by 2019 and will not accommodate predicted traffic increases due to known growth in the area.

M42 Junction 6 has been noted as currently operating at near capacity with some 7000 to 7500 vehicles using the junction during a typical peak hour. On event days at the NEC, additional daily event based demand of some 1500 to 2000 vehicles with typically 500 additional vehicles during the peak hours, contributes to significant congestion. This in turn affects both the M42 mainline and the local road network impacting on journey times, resilience and safety. From surveys undertaken during a major event at the NEC, traffic queues up to 1km were observed on the approaches to Junction 6.

Significant development has been earmarked for the area including the growth proposals at the NEC, Birmingham Airport and the planned HS2 station, as well as further aspirational development by the Urban Growth Company (tasked with delivering infrastructure, on behalf of UKC, to the strategically economic area around the planned HS2 Birmingham Interchange station). It is considered that without a major upgrade of the existing junction, there is likely to be significant impact on these proposed developments as well as a severe impact on the local, regional and even national economy, as connectivity and accessibility to these nationally important businesses will be severely affected. Without infrastructure investment to improve the junction not only would congestion worsen, but a major investment opportunity of national significance could be lost.

The above issues demonstrate the compelling need to improve this junction, in order to improve the access and functionality of this critical node in the Strategic Road Network, which will enable the junction to accommodate the planned economic growth and provide support for further growth in the region.

Following an exhaustive process to identify a viable preferred option to improve the junction, Highways England promoted three viable options, which cross the green belt, from the A45 to the M42 south of Junction 6. All of the viable options have similar adverse environmental impacts for which mitigation measures can be carried out. However, Option 2 has more adverse impacts than Options 1 and 3 due to greater visual impact, an increased number of properties affected and greater impact on the built environment.

The assessment demonstrated that although Option 3 is cheaper, requires less landtake and provides a better Value for Money score. It has a number of issues including geometry, effect on the built environment, and visual effect on the green belt and could preclude future development of M42 Junction 6 if the aspirational

development in the area comes forward. These issues outweigh the benefits of Option 3, and consequently this option is not being taken forward as the preferred route. Option 2 also incorporated the disbenefits of both Option 1 and Option 3 resulting in a low BCR and was also not taken forward as the preferred route.

The alignment of Option 1B is a minor modification to Option 1 which is supported by 64% of the stakeholders including the local populace, the MP and local businesses such as Birmingham Airport, NEC, JLR and HS2. It has less impact on the 'openness' of the green belt, provides more resilience to the road network, has the greater potential to minimise the effect on the landscape, supports the future medium term aspirational development in the area, and has the potential to be modified to accommodate long term aspirational development. The costs would also reduce below Option 3 if the proposed MSA obtains their planning permission prior to the scheme's potential start of works, enabling them to make a contribution towards the cost of the southern junction.

The financial case demonstrates that all the viable options could be affordable following preliminary design. The project has been identified in the RIS and Highways England's Delivery Plan 2015-2020. The current forecast for the preferred option (Option 1) with free-flow links at Junction 6 but omitting the link outside the NMM is £298m including portfolio risk. Further savings could be made during preliminary design to make this option affordable. Should the MSA receive planning approval and make a contribution to the scheme, the costs will reduce further.

The economic case identifies a ''high' value for money category for Option 3,'medium' for Option 1 and 'Poor' for Option 2.These scores would improve during the next stage as the preliminary design identifies further benefits and efficiencies.

12.2 Options Assessment

The options assessment has been carried out over an eighteen month period. Forty options were initially identified which would meet the objectives for the scheme.

A high level assessment process was undertaken, reducing the number of options down to eighteen and a further detailed EAST assessment helped to further reduce the options down to a shortlist of six.

A series of stakeholder engagement meetings were held to discuss the impact these options would have on the stakeholders, and these discussions enabled the team to take account of the major stakeholders' views (including those of the Parish Councils) during the final sifting of options.

The six options were assessed in more detail in order to identify those that should be taken to Public Consultation. The detailed assessments were carried out using the following criteria: environmental, highways geometry, buildability and safety impacts, traffic benefits, cost estimates and stakeholder engagement.

Options were discounted on the basis of high cost and low value for money, safety impact of insufficient weaving lengths to a new junction, direct environmental impact to an existing SSSI, low traffic benefits and major disruption to the network. This

resulted in the identification that the only viable way forward was to have a new southern junction with a link from the M42 to the A45 at Clock Interchange. Three options of this southern junction theme were identified and taken to Public Consultation:

- Option 1 – Southern Junction 2km south of Junction 6 with a link road west of Bickenhill village to A45 Clock Interchange.
- Option 2 – Southern Junction 2km south of Junction 6 with a link road east of Bickenhill village to A45 at Clock Interchange via an additional roundabout.
- Option 3 – Southern Junction 1km south of Junction 6 with northbound exit and southbound entry only and link road to A45 at Clock Interchange via an additional roundabout.

Free Flow links around the north east, north west and south east of the M42 Junction 6 were also proposed in addition to these options, subject to further review

The Public Consultation was held between 9 December 2016 and 27 January 2017. The responses received during the consultation period showed 71% agreed that M42 Junction 6 needed improving and that 64% of the respondees preferred Option 1 over Options 2 or 3. This is a very clear message that Option 1 is the stakeholders' option of choice. In general, respondees were also in favour of the free flow links.

A final series of workshops were held to evaluate the responses from the consultation and the results of further analysis of the three options in order to identify which option should be taken forward as the preferred option. The decision on route choice was based on the following criteria:

- Department for Transport (DfT) RIS brief;
- Highways England Imperatives;
- Scheme Economics;
- Public Consultation results;
- Environmental Effects;
- Highways England Key Performance Indicators (KPIs);
- General (stakeholder issues, buildability, number of departures, etc).

The workshops also considered variants to Option 1, designed to mitigate the concerns raised during the Public Consultation. These variants were:

i. Option 1A –the alignment deviates to the west of Option 1 to avoid direct impact on the Warwickshire GAA sports fields;
ii. Option 1B – this variation impacts just one of the GAA, sports fields;
iii. Option 1C – this option deviates to the east of the GAA sports fields.

The results of the assessment were that Option 1B scored the highest, and it was agreed that Option 1B should be taken forward as the recommended option in order to minimise the impact on the GAA sports fields.

12.3 The Recommended Option

Option 1B (a variant of Option 1) is Highways England's recommended option. The main aspects in determining that this is the best option were:

- Option 1 received the largest support at public consultation, from both the local population and businesses (64%);
- Option 1 has the least impact on the 'openness of the green belt';
- Option 1 would have the best possibility of gaining planning approval
- Option 1 would need the fewest departures from standards;
- Option 1 has a medium Value for Money score and provides the most opportunity for improvement of benefits;
- Although Option 1 requires the most landtake, it would mainly be in cutting and provide more scope for mitigation to minimise the effect on the landscape and environment;
- Option 3 would require embankments that impact the'openness of the green belt',
- Option 2 and 3 would bisect Bickenhill, passing beneath Church Lane;
- Option 1 (and 2) would not preclude future potential junction improvement works required if some of the 'aspirational' developments gain planning approval;
- Option 1 (and 2) would not preclude the planning application for a new Motorway Service Area, proposed by Extra;
- Option 1 would have less impact on private properties than Options 2 and 3; and
- Option 1 has less impact on the statutory utilities in the area than Options 2 and 3.

Option 1B, with the minor alignment change to Option 1 has less impact on the GAA sports fields, though would directly impact one property.

The assessment also identified that there were issues in providing the southeast free-flow link at Junction 6 and the north facing slip roads from the new southern junction. Consequently a decision was made to remove these elements from the proposed scheme. The main reasons for this decision were:

The South East Free Flow Link:

- There were significant challenges with the horizontal and vertical geometry,;
- The link would prevent the service road, parallel to the south of the A45 east of Junction 6, from connecting to the M42 Junction 6 forcing all traffic using this road to access the wider road network at Stonebridge Island. This would have a significant impact on the small businesses located on this road;
- The costs of the new link were prohibitively high, compared to the potential benefits; and
- Smaller scale improvement to this corner of the roundabout (similar to that proposed in HS2's bill) would provide some improvement to this quadrant of the roundabout.

The North-facing slip roads from the new southern junction:

- There were significant challenges with the horizontal geometry of these slip roads regarding their proximity to M42 Junction 6, which would require departures from standards for reduced weaving length between the two junctions;
- The traffic model indicated that the south bound off slip would have approximately 300vph, and the northbound on slip would not be used. These extremely low traffic figures would not support the costs of the slip roads on their own, let alone the additional cost of improving the M42; and
- A case was made that the slip roads would add resilience to the network; if M42 Junction 6 stops working. The cost of providing these slip roads - not just In terms of capital, but also in terms of operational safety disbenefits to the wider junction - outweigh this minor benefit.

Consequently, Option 1B is the preferred option to take forward as Highways England's preferred route.

Glossary of Terms and Abbreviations

AADF	Annual Average Daily Flow
ADS	Advance Direction Sign
ALC	Agricultural Land Classification
ALR	All Lanes Running
AMI	Advance Motorway Indicators
AQMA	Air Quality Management Area
ARCADY	Assessment of Roundabout Capacity and Delay
AS14	Autumn Statement 2014
ASC	Asset Support Contract
ASTs	Appraisal Summary Tables
ATM	Active Traffic Management
BAP	Biodiversity Action Plan
BCR	Benefit Cost Ratio
BGS	British Geological Survey
CCTV	Closed-Circuit Television
CEC	Combined Equipment Cabinet
CEMP	Construction Environmental Management Plan
CITE	Connected Intelligent Transport Environment
COBA	Cost Benefit Analysis
COBALT	Cost and Benefit to Accidents – Light Touch
CPRE	Campaign to Protect Rural England
CSR	Client Scheme Requirements
D3AP	All-Purpose Three-Lane Dual Carriageway
D3M	Dual Three-Lane Motorway
D3UAP	Urban All-Purpose Three-Lane Dual Carriageway
DCO	Development Consent Order
DfS	Departure from Standard
DfT	Department for Transport
DHS	Dynamic Hard Shoulder
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EAST	Early Assessment Sifting Tool
EHO	Environmental Health Officer
ERA	Emergency Refuse Areas
ERT	Emergency Telephones
FTMS	Fixed Text Message Sign
GAA	Gaelic Athletic Association
GDP	Gross Domestic Product

GIS	Geographic Information System
GQA	General Quality Assessment
HADECS3	Highways Agency Digital Enforcement Camera System 3
HATMS	Highways Agency Traffic Management System
HE	Highways England
HECSD	Highways England Commercial Services Division
HGIP	Hub Growth and Infrastructure Plan
HGV	Heavy Goods Vehicle
HS	Hard Shoulder
HS2	High Speed Two
HSI	Habitat Suitability Index
HSM	Hard Shoulder Monitoring
HSR	Hard Shoulder Running
HV	High Voltage
IAN	Interim Advice Note
ICD	Inscribed Circle Diameter
JLR	Jaguar Land Rover
KPI	Key Performance Indicator
LAD	Local Authority District
LAM	Local Area Model
LAQM.TG(16)	Local Air Quality Management Technical Guidance
LBS1	Lane Below Signal
LCA	Landscape Character Assessment
LWS	Local Wildlife Site
MAC	Maintaining Agent Contractor
MIDAS	Motorway Incident Detection And Signalling
MM	Managed Motorway
MP	Member of Parliament
MRSS	Maintenance and Repair Strategy Statement
MS3	Motorway Signal mark 3
MS4	Motorway Signal mark 4
MSA	Motorway Service Area
NB	Northbound
NCC	National Conference Centre
NEC	National Exhibition Centre
NIA	Noise Important Areas
NMM	National Motorcycle Museum
NMU	Non-Motorised Users
NPPF	National Planning Policy Framework
NRMM	Non-Road Mobile Machinery
NRTS	National Roads Telecommunications Service

NSIP	Nationally Significant Infrastructure Project
NTEM	National Trip End Model
NVC	National Vegetation Classification
PCF	Project Control Framework
PHV	Percentage of Heavy goods Vehicles
PINS	Planning Inspectorate
PPP	Pinch Point Programme
PRISM	Policy Responsive Integrated Strategy Model
PRoW	Public Rights of Way
PT	Public Transport
PTZ	Pan/Tilt/Zoom
QUADRO	Queues and Delays at Roadworks
RFC	Ratio of Flow to Capacity
RIS	Road Investment Strategy
RM	Ramp Metering
SAR	Scheme Assessment Report
SB	Southbound
SES	Safety, Engineering and Standards
SMBC	Solihull Metropolitan Borough Council
SM-HSR	Smart Motorway – Hard Shoulder Running
SMIS	Structures Management Information System
SoCC	Statement of Community Consultation
SRN	Strategic Road Network
SRO	Senior Responsible Officer
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Drainage Systems
SUSTRANS	Sustainable Transport
TA	Technical Advice
TAG	Transport Analysis Guidance
TAR	Technical Appraisal Report
TEE	Transport Economic Efficiency
TJR	Through Junction Running
TUBA	Transport Users Benefit Appraisal
UGC	Urban Growth Company
UKC	UK Central
V2I	Vehicle To Infrastructure
V2V	Vehicle To Vehicle
VIP	Very Important Person
VISSUM	German for “Traffic in Cities – Simulation Model”
VMS	Variable Message Sign
VMSL	Variable Mandatory Speed Limits

vph	Vehicles per hour
WebTAG	Web Based Transport Analysis Guidance
WITA	Wider Impacts in Traffic Appraisal
WMRCC	West Midlands Regional Control Centre

Appendices

A – Option Drawings

B – Preferred Route Plan

C – Structures Drawings

D – Constraint Plans

E – Assessment Tables

F - Technical Notes and Narratives

G – ASTs

H – Traffic Flow Schematic

I – Technology & Maintenance Assessment

Appendices

List of documents:

Appendix A – Option Drawings

Option 1 General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-DR-CH-0004
Option 2 General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-DR-CH-0008
Option 3 General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-DR-CH-0001
Option 1 Variants - HE551485-MOU-GEN-M42_J6-SK-CH-0098
Option 1B Recommended Preferred Route Announcement - HE551485-MOU-GEN-M42_J6-SK-CH-0120
M42 Junction 6 General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-SK-CH-0047
Clock Interchange General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-DR-CH-0011

Appendix B – Option 1 Plan & Profile Drawings

Option 1 Proposed Plan & Profile Ch.0 to Ch.600 - HE551485-MOU-HML-M42_J6-DR-CH-0142
Option 1 Proposed Plan & Profile Ch.600 to Ch.1200 - HE551485-MOU-HML-M42_J6-DR-CH-0143
Option 1 Proposed Plan & Profile Ch.1200 to Ch.1800 - HE551485-MOU-HML-M42_J6-DR-CH-0144
Option 1 Proposed Plan & Profile Ch.1200 to Ch.2371 - HE551485-MOU-HML-M42_J6-DR-CH-0145

Appendix C – Structures Drawings

Plan View of New Structures for Option 1 – Outline Design - HE551485-MOU-GEN-M42_J6-DR-CB-0001
Plan View of New Structures for Option 2 – Outline Design Part 1 - HE551485-MOU-GEN-M42_J6-DR-CB-0002
Plan View of New Structures for Option 2 – Outline Design Part 2 - HE551485-MOU-GEN-M42_J6-DR-CB-0003

Plan View of New Structures for Option 3 – Outline Design - HE551485-MOU-GEN-M42_J6-DR-CB-0004

Plan View of New Structures for Free Flow Link Option – Outline Design - HE551485-MOU-GEN-M42_J6-DR-CB-0005

Appendix D – Constraint Plans

Stakeholder Plan Key Areas/Developments - HE551485-MOU-GEN-M42_J6-SK-D-0100

Existing Statutory Undertakers Apparatus Plan - HE551485-MOU-VUT-M42_J6-SK-D-0001

Non-Motorised Users Plan - HE551485-MOU-ENM-M42_J6-SK-D-0001

Geohazard Plan - HE551485-MOU-HGT-M42_J6-DR-GE-0001

Environmental Constraints Sheet 1 of 2 - HE551485-MOU-EGN-M42_J6-DR-LE-0025

Environmental Constraints Sheet 2 of 2 - HE551485-MOU-EGN-M42_J6-DR-LE-0026

Proposed NMU Realignment at Clock Junction - HE551485-MOU-GEN-M42_J6-SK-CH-0118

Appendix E – Assessments

M42 Options Choice – Options 1, 1B, 2 and 3

M42 Options Choice – Options 1, 1A, 1B and 1C

Phase 2 Options Comparison - HE551485-MOU-GEN-M42_J6-DT-CH-0001

Appendix F – Technical Notes & Design Narratives

M42 J6 Free flow links (Option 11A) - HE551485-MOU-GEN-M42_J6-FN-CH-0057

Option 1 (Option 2R) - HE551485-MOU-GEN-M42_J6-FN-CH-0059

Option 2 (Option 2R East) - HE551485-MOU-GEN-M42_J6-FN-CH-0060

Option 3 (Option 2P) - HE551485-MOU-GEN-M42_J6-FN-CH-0055

Option 1 (Option 2R West) 2041 Emerging Traffic Flow Results – Impact on a New Southern Junction - HE551485-MOU-GEN-M42_J6-FN-CH-0068

Impact on Statutory and Non Statutory Sites

Appendix G – Appraisal Summary Table

Appraisal Summary Table Option 1 - HE551485-MOU-00-XX-PC-TR-0012

Appraisal Summary Table Option 2 - HE551485-MOU-00-XX-PC-TR-0014

Appraisal Summary Table Option 3 - HE551485-MOU-00-XX-PC-TR-0016

Appendix H – Traffic Flow Schematics

M42 Junction 6 Turning Movements (AM & PM) – Existing & Do Minimum - HE551485-MOU-VTR-M42_J6-SK-CH-0001

Traffic Flow Schematic AM & PM Peaks – Existing & Do Minimum (2021 & 2041) - HE551485-MOU-VTR-M42_J6-SK-CH-0003

Option 1 Traffic Flow Schematic – 2041 Peaks - HE551485-MOU-VTR-M42_J6-SK-CH-0008

Appendix I – Technology & Maintenance Assessment

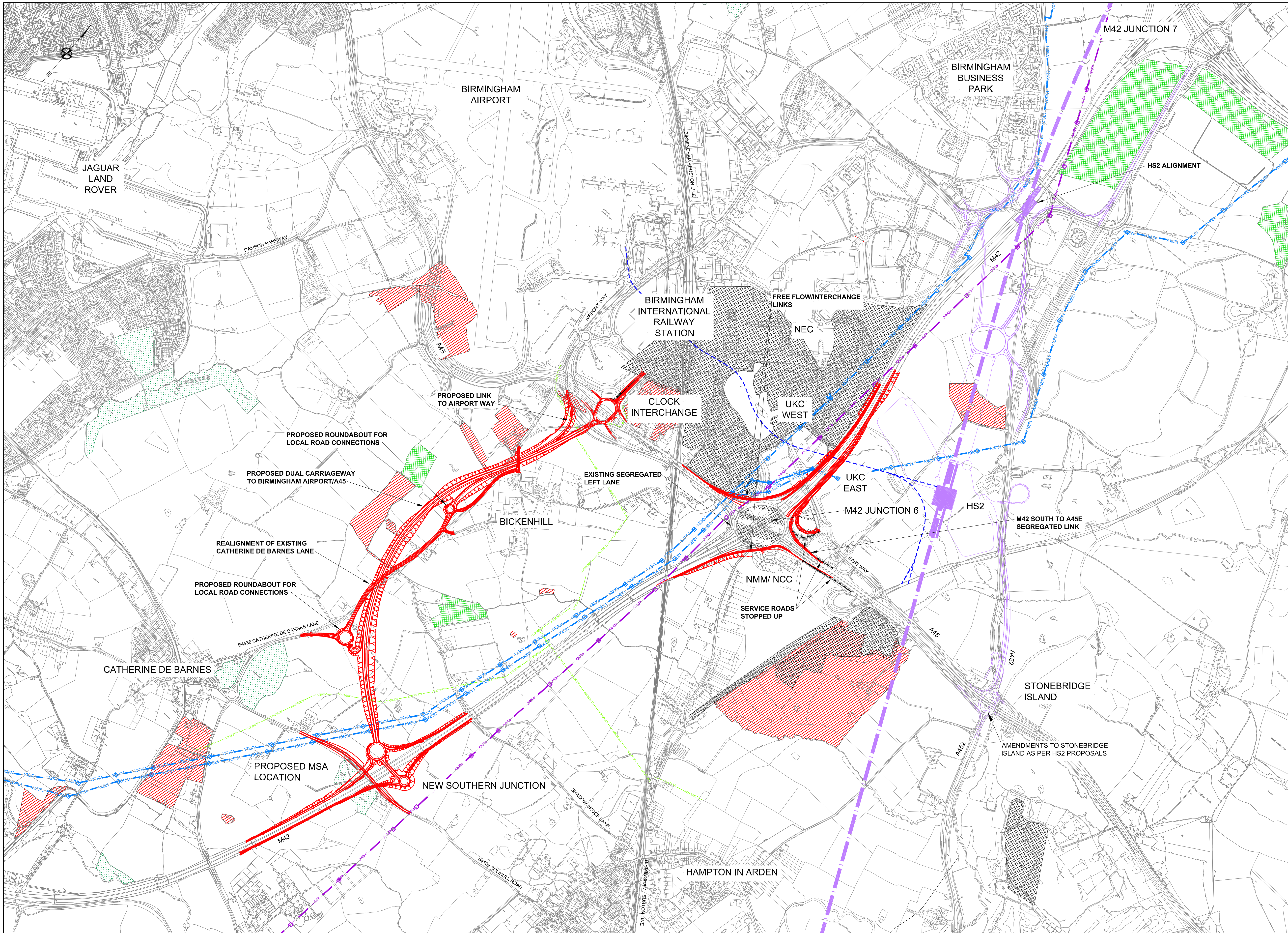
Option 1 and 2 (Northbound): J6 to J7, J5a to J6, J5 to J5a,

Option 1 and 2 (Southbound): J7 to J6, J6 to J5a, J5a to J5

Option 3 (Northbound): J6 to J7, J5a to J6, J5 to J5a

Option 3 (Southbound): J7 to J6

Appendix A – Option Drawings



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 RAIL ALIGNMENT BASED ON AN XREF RECEIVED FROM HS2 GROUP.
3. HS2 PEOPLE MOVER BASED ON INTERPRETATION OF HS2 HYBRID BILL DRAWINGS.
4. NMU PROVISIONS ARE NOT SHOWN AND NO ALLOWANCES MADE FOR PROPOSED STRUCTURES.
5. EXISTING PROW ARE NOT SHOWN. FOR DETAILS REFER TO DRAWING HE551485-MOU-ENM-M42 J6-SK-D-0001.
6. FOR DETAILS OF ENVIRONMENTAL CONSTRAINTS REFER TO DRAWINGS HE551485-MOU-EGN-M42_J6-DR-LE-0025 AND 0026.
7. FOR DETAILS OF GEOHAZARDS REFER TO DRAWING HE551485-MOU-HGT-M42 J6-DR-GE-0001.
8. SIZES ARE INDICATIVE FOR ALL ROUNDABOUTS SHOWN.
9. THE A45 TO THE WEST OF J6 IS CONSIDERED AS URBAN AND THE A45 TO THE EAST OF J6 IS CONSIDERED AS RURAL. THE M42 AND ASSOCIATED SLIP ROADS ARE CONSIDERED AS RURAL. THESE WILL IMPACT THE GEOMETRY OF PROPOSALS INCLUDING CROSS SECTIONS.
10. ANY IMPACT ON HV OVERHEAD PYLONS SHOULD BE COORDINATED WITH NATIONAL GRID AND WPD.

KEY

- PROPOSED ALIGNMENT
- CARRIAGEWAY TO BE STOPPED UP
- HS2 RAIL ALIGNMENT (INDICATIVE)
- HS2 ROAD ALIGNMENT (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- 132KV — WESTERN POWER DISTRIBUTION (132kV)
- 400KV — NATIONAL GRID (400kV)
- AQUEDUCT — AQUEDUCT
- LANDFILL
- MADE GROUND
- SSSI
- ANCIENT WOODLAND/COPPICE/COPSE
- NMM/NCC — NATIONAL MOTORCYCLE MUSEUM/ NATIONAL CONFERENCE CENTRE
- NEC — NATIONAL EXHIBITION CENTRE
- UKC — UK CENTRAL

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P05	PROPOSED ALIGNMENT UPDATED & ADDITIONAL NOTES ADDED. STRUCTURE REFERENCES REMOVED.	JC	DM	GM	MAY 17
P04	STRUCTURES REFERENCES ADDED	TT	GM	GM	NOV 16
P03	OPTION 11A NOTE ADDED	JC	GM	GM	NOV 16
P02	FREE FLOW LEFTS AT JUNCTION 6 ADDED	JC	GM	GM	OCT 16

Project

WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title

OPTION 1
GENERAL ARRANGEMENT
DRAWING

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1:10000	JC	DM	GM	RJ
Original Size: A1	Date: OCT 16	Date: OCT 16	Date: OCT 16	Date: OCT 16

Status: SUITABLE FOR INFORMATION

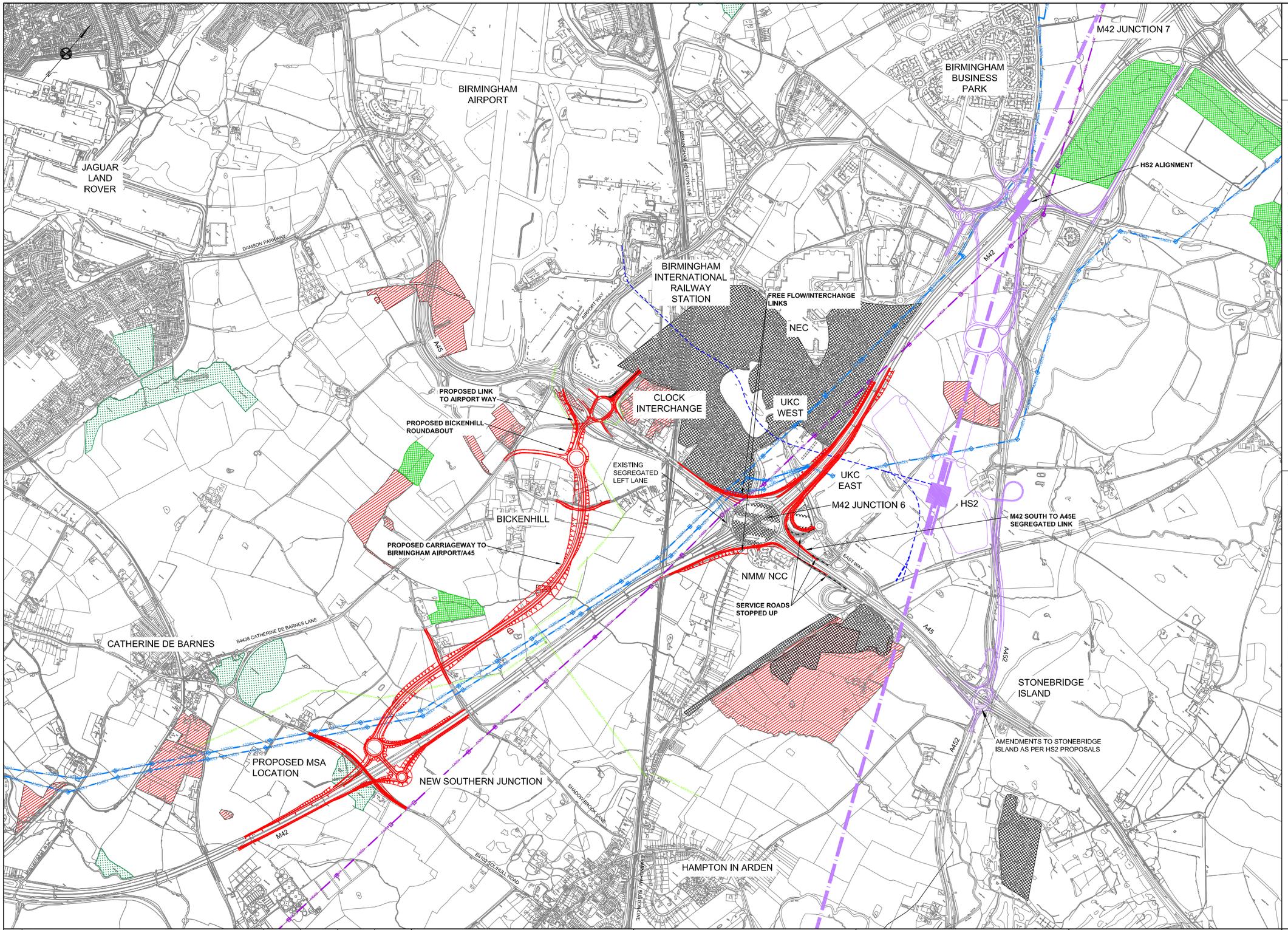
Drawing No (Project - Originator - Volume / Location - Type - Role - Number):
HE551485 - MOU - GEN
M42_J6 - DR - CH - 0004

Suitability: S2

Revision: P05

by: Jamie Clift

plot date: 13/06/2017 11:59:28



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
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3. HS2 PEOPLE MOVER BASED ON INTERPRETATION OF HS2 HYBRID BILL DRAWINGS.
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6. FOR DETAILS OF ENVIRONMENTAL CONSTRAINTS REFER TO DRAWINGS HE551485-MOU-EGN-M42_J6-DR-LE-0025 AND 0026.
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Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P05	STRUCTURE REFERENCES REMOVED & ADDITIONAL NOTES ADDED	JC	GM	GM	MAY 17
P04	STRUCTURES REFERENCES ADDED	TT	GM	GM	NOV 16
P03	OPTION 11A NOTE ADDED	JC	GM	GM	NOV 16
P02	FREE FLOW LEFTS AT JUNCTION 6 ADDED	JC	GM	GM	OCT 16

Project: **WEST MIDLANDS AREA 9**
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title: **OPTION 2 GENERAL ARRANGEMENT DRAWING**

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Original Size: A1	Date: NOV 16	Date: NOV 16	Date: NOV 16	Date: NOV 16

Status: SUITABLE FOR INFORMATION

Drawing No: Project	Originator	Volume	Suitability
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M42_J6 -	DR -	CH - 0008	Revision: P05
Location	Type	Role	Number

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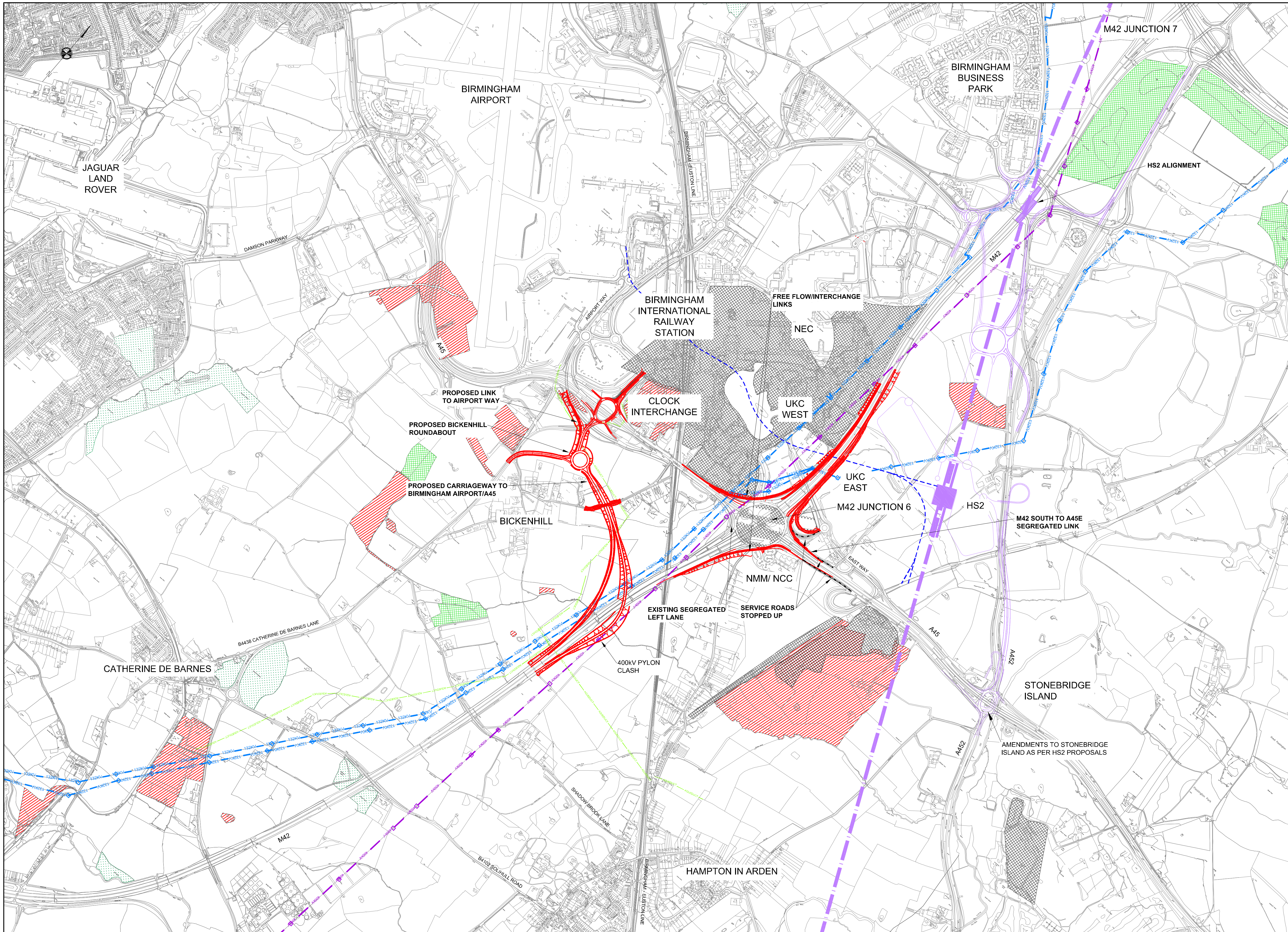

NOTES

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6. FOR DETAILS OF ENVIRONMENTAL CONSTRAINTS REFER TO DRAWINGS HE551485-MOU-EGN-M42_J6-DR-LE-0025 AND 0026.
7. FOR DETAILS OF GEOHAZARDS REFER TO DRAWING HE551485-MOU-HGT-M42 J6-DR-GE-0001.
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Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P05	STRUCTURE REFERENCES REMOVED & ADDITIONAL NOTES ADDED	JC	DM	GM	MAY 17
P04	STRUCTURES REFERENCES ADDED	TT	GM	GM	NOV 16
P03	OPTION 11A NOTE ADDED	JC	GM	GM	NOV 16
P02	MINOR ROADS & ASSOCIATED TEXT REMOVED	JC	GM	GM	OCT 16

Project

WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title

OPTION 3
GENERAL ARRANGEMENT DRAWING

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Original Size	Date	Date	Date	Date
A1	SEP 16	SEP 16	OCT 16	OCT 16

Status: SUITABLE FOR INFORMATION

Drawing No				Suitability
Project	Originator	Volume		
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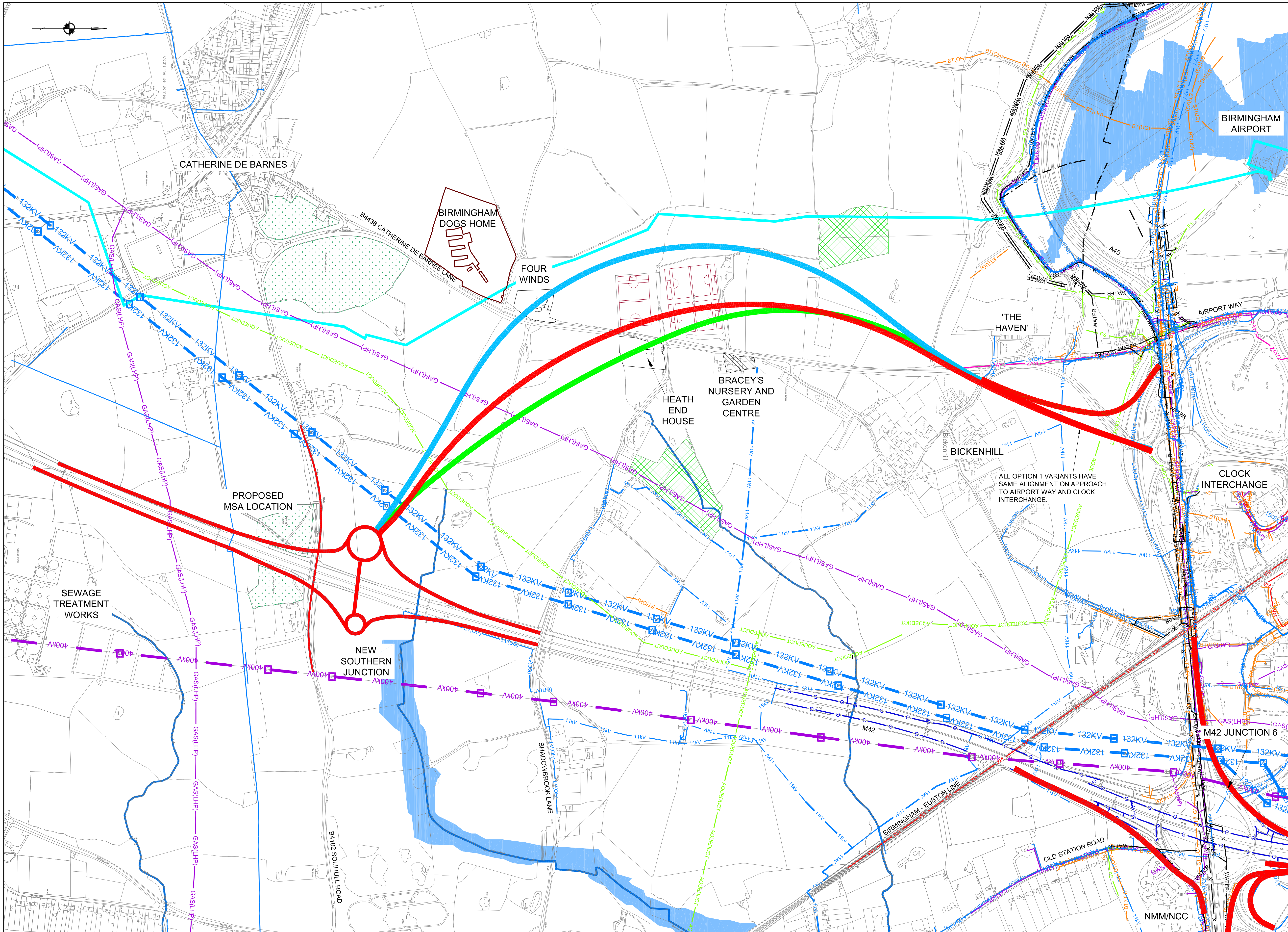
M42_J6 -	DR -	CH -	0001	Revision P05
Location	Type	Role	Number	

by: Jamie Clift
plot date: 13/06/2017 11:58:03



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. STATUTORY UNDERTAKER APPARATUS SHOWN ARE INDICATIVE AND BASED ON INFORMATION RECEIVED FOLLOWING C2 ENQUIRIES.
3. OPTION 1 IS AS PER PUBLIC CONSULTATION REFERENCE AND DESIGN TEAM REFERENCE WAS 2R(WEST).
4. FOR OPTION 1 SEE DRAWING HE551485-MOU-GEN-M42_J6-SK-CH-0099.
5. FOR OPTION 1 VARIANT A SEE DRAWING HE551485-MOU-GEN-M42_J6-SK-CH-0100.
6. FOR OPTION 1 VARIANT B SEE DRAWING HE551485-MOU-GEN-M42_J6-SK-CH-0101.
7. FOR OPTION 1 VARIANT C SEE DRAWING HE551485-MOU-GEN-M42_J6-SK-CH-0102.

KEY

Symbol	Description
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	OPTION 1 - VARIANT B
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	SSSI
	ANCIENT WOODLAND/COPPICE/COPSE
	RIVER/STREAM/BROOK
	FLOOD ZONE
	ESSO PETROLEUM MAIN
BT(UG)	BT OPENREACH (UNDERGROUND)
BT(OH)	BT OPENREACH (OVERHEAD)
132kV	WESTERN POWER DISTRIBUTION (132kV)
11kV	WESTERN POWER DISTRIBUTION (11kV)
LV(OH)	WESTERN POWER DISTRIBUTION (LV) OH
LV(UG)	WESTERN POWER DISTRIBUTION (LV) UG
G	GENESYS (MOTORWAY COMMUNICATIONS)
GAS(LHP)	NATIONAL GRID GAS (LHP)
GAS(LP)	NATIONAL GRID GAS (LP)
GAS(MP)	NATIONAL GRID GAS (MP)
400kV	NATIONAL GRID POWER (OH) 400kV
ZAYO	ZAYO GROUP
VM	VIRGIN
VODA	VODAFONE
WATER	SEVERN TRENT WATER PIPE
FS	SEVERN TRENT FOUL SEWER
FS(P)	SEVERN TRENT PRESSURISED FOUL SEWER
Xs	SEVERN TRENT ABANDONED SEWER
X	SEVERN TRENT ABANDONED PIPE
AQUEDUCT	AQUEDUCT
	WESTERN POWER DISTRIBUTION TBC
□	WESTERN POWER DISTRIBUTION PYLON
□	NATIONAL GRID PYLON

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P03	DRAFT FOR INFORMATION NOTE REMOVED	JC	DM	OG	MAY 17
P02	OPTION 1 VARIANT C REMOVED & VARIANT A ALIGNMENT UPDATED	TT	DM	GM	APR 17

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
OPTION 1 VARIANTS

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1:5000	TO	DM/OM	GM	RJ
Original Size A1	Date MAR 17	Date MAR 17	Date MAR 17	Date MAR 17

Status: SUITABLE FOR INFORMATION

Drawing No				Suitability
Project HE551485 -	Originator MOU -	Volume GEN		S2
Location M42_J6 -	Type SK -	Role CH -	Number 0098	Revision P03

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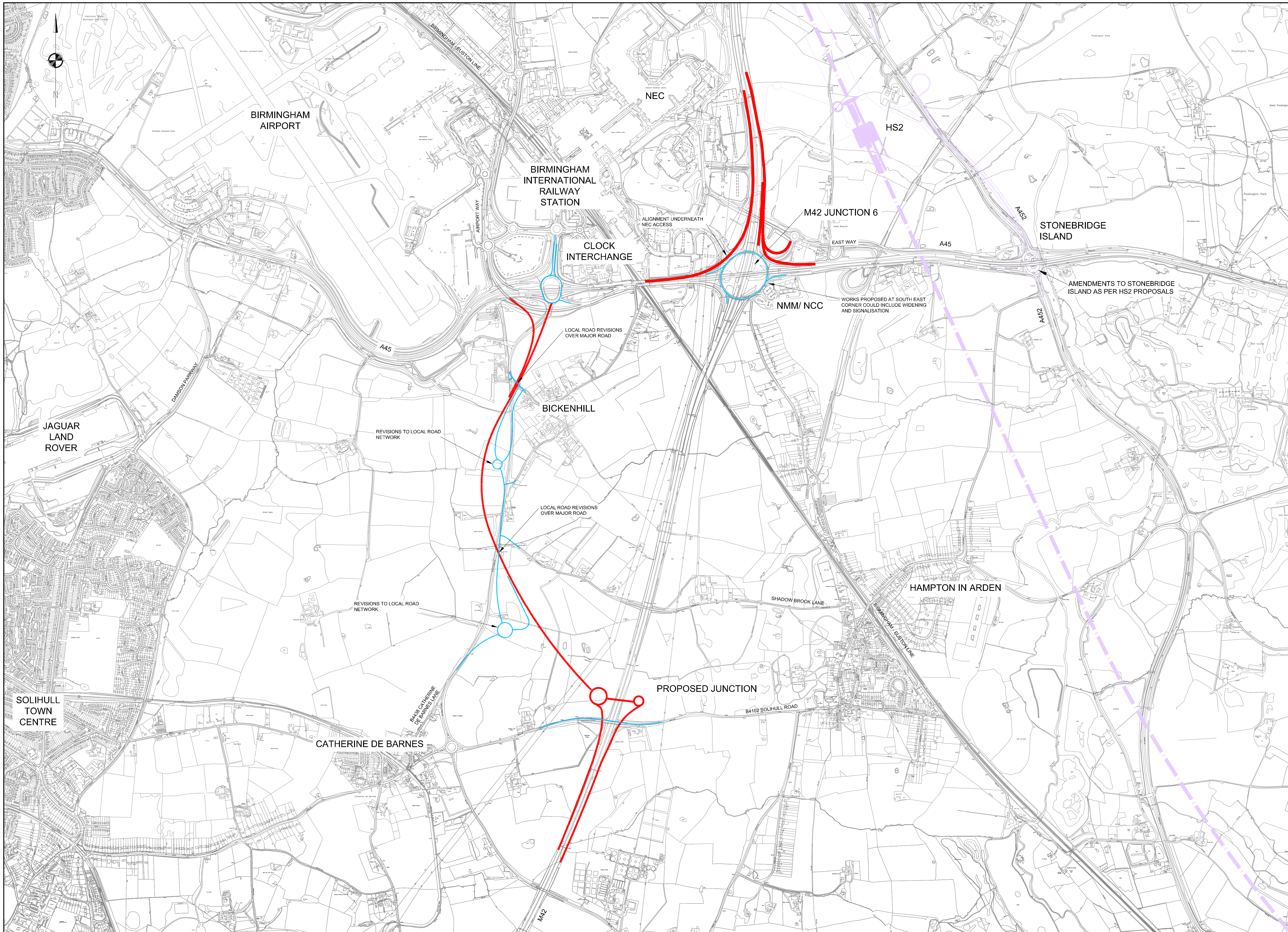

NOTES

1. DO NOT SCALE FROM THIS DRAWING.

KEY

- PROPOSED ALIGNMENT OPTION 1B
- PROPOSED ALIGNMENT OPTION 1B (JUNCTIONS AND LOCAL ROADS)
- HS2 RAIL ALIGNMENT (INDICATIVE)
- HS2 ROAD ALIGNMENT (INDICATIVE)

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P03	MINOR TEXT AMENDMENTS	JC	DM	OG	JUL 17
P02	PLAN AND KEY REVISED - MINOR UPDATES	JC	DM	GM	JUN 17

Project

WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title

OPTION 1B RECOMMENDED PREFERRED ROUTE ANNOUCEMENT

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Scale	Designed / Drawn	Checked	Approved	Authorised
1:10000	JC	GM	OG	RJ
Original Size: A1	Date: JUNE 17	Date: JUNE 17	Date: JUNE 17	Date: JUNE 17

Status: SUITABLE FOR INFORMATION

Drawing No

Project	Originator	Volume
HE551485 -	MOU -	GEN
M42_J6 -	SK -	CH - 0120
Location	Type	Role / Number

Suitability: S2

Revision: P03

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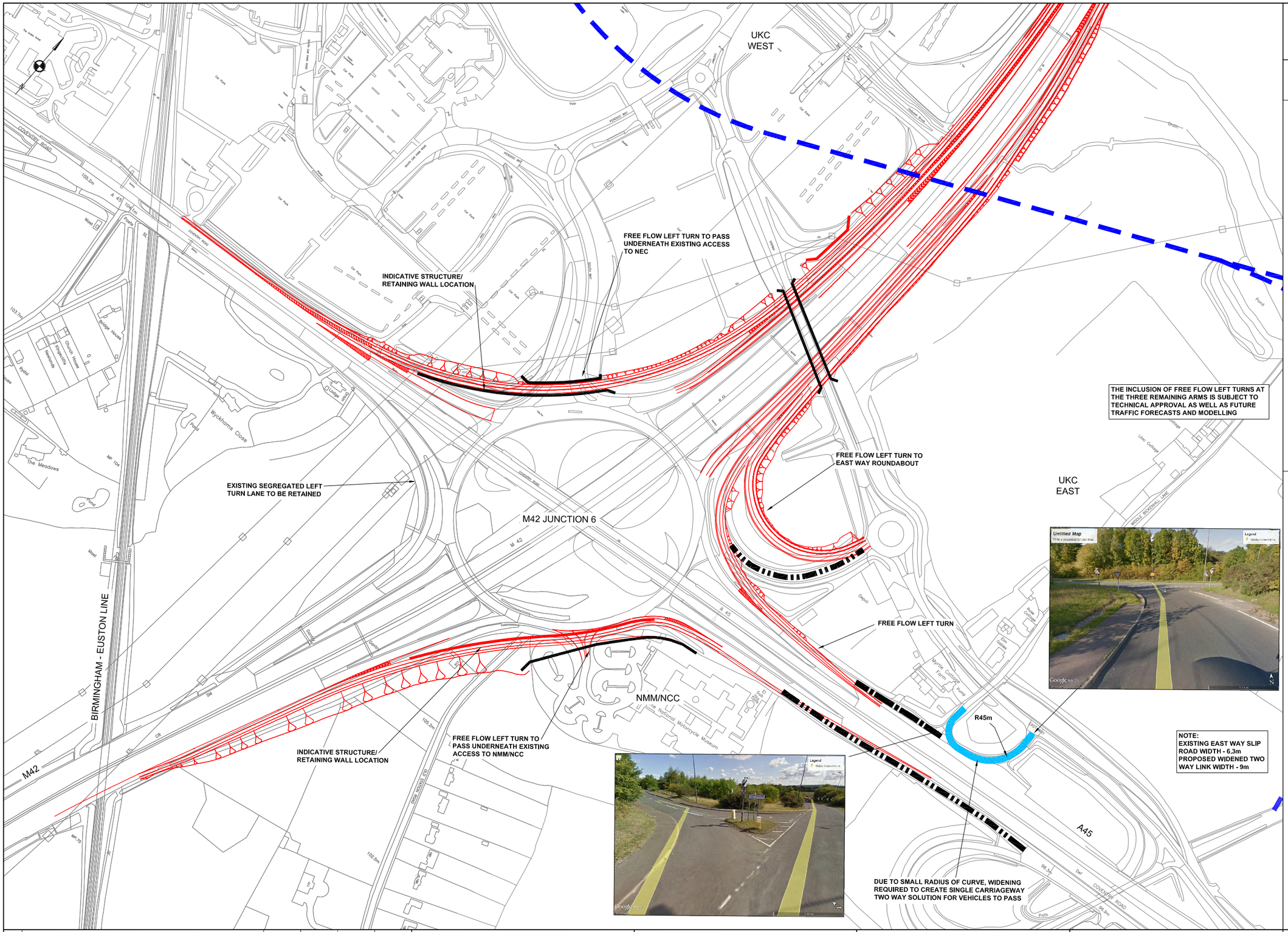
by: Jamie Clift

plot date: 11/07/2017 13:28:53



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. HS2 PEOPLE MOVER BASED ON INFORMATION RECEIVED FROM HS2.
3. EXISTING ROAD NETWORK BASED ON OS MAPPING, NOTE NOT ALL ROAD NETWORK IS SHOWN FOR CLARITY.
4. EXISTING JUNCTIONS TO BE AMENDED, EXTENT TO BE CONFIRMED.

KEY

- PROPOSED ALIGNMENT MAJOR ROADS
- HS2 PEOPLE MOVER (INDICATIVE)
- STRUCTURE LOCATIONS (INDICATIVE)
- EXISTING C'WAY TO BE STOPPED UP
- PROPOSED ALIGNMENT MINOR ROADS

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P02	DRAWING TITLE UPDATED & TEXT SIZE REDUCED	JC	DM	GM	JUN 17

Project: **WEST MIDLANDS AREA 9**
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title: **M42 JUNCTION 6 GENERAL ARRANGEMENT DRAWING**

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Scale	Designed / Drawn	Checked	Approved	Authorised
1:5000	BAA	DM	GM	RJ
Original Size: A1	Date: NOV 16	Date: NOV 16	Date: NOV 16	Date: NOV 16

Status: SUITABLE FOR INFORMATION

Drawing No: HE551485 - MOU - GEN
M42_J6 - SK - CH - 0047

Suitability: S2

Revision: P02

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last date: 05/07/2017 15:16:24 by: Jamie Clift

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. EXISTING PROW ARE NOT SHOWN. FOR DETAILS REFER TO DRAWING HE551485-MOU-ENM-M42 J6-SK-D-0001.
3. FOR DETAILS OF ENVIRONMENTAL CONSTRAINTS REFER TO DRAWINGS HE551485-MOU-EGN-M42_J6-DR-LE-0025 AND 0026.
4. FOR DETAILS OF GEOHAZARDS REFER TO DRAWING HE551485-MOU-HGT-M42 J6-DR-GE-0001.
5. STATUTORY AUTHORITY APPARATUS REMOVED FOR CLARITY. REFER TO DRAWING HE551485-MOU-VUT-M42 J6-SK-D-0001.

KEY

PROPOSED ALIGNMENT

WIDENED/REALIGNED B4438 BICKENHILL LANE CARRIAGEWAY

B4438 BICKENHILL LANE

BIRMINGHAM - EUSTON LINE

EXISTING BICKENHILL LANE WIDENED TO 4 LANES (EXISTING FREE FLOW RETAINED)

SIGNAL CONTROL

RE-ALIGNED FREE-FLOW LINK FROM B4438 TO A45 EASTBOUND ONSLIP

ARDEN HOTEL

PETROL STATION

PRIORITY CONTROL

A45 EB OFFSLIP TO CLOCK INTERCHANGE TWO LANES AS PER EXISTING

CLOCK INTERCHANGE

CLOCK INTERCHANGE OVERBRIDGES TO BE WIDENED TO ACCOMMODATE 3 LANES WITHIN EXISTING STRUCTURE. NOTE: NO STRUCTURE ASSESSMENT UNDERTAKEN.

A45 EASTBOUND

PROPOSED FOOTWAY/CYCLEWAY OVERBRIDGE (SEE DRAWING HE551485-MOU-GEN-M42_J6-DR-CH-0118)

A45 WESTBOUND

MINOR REALIGNMENT REQUIRED TO EXISTING SLIP ROAD FROM CLOCK INTERCHANGE TO A45 WESTBOUND

SIGNAL CONTROL

PROPOSED LINK MERGES AS A LANE GAIN

EXISTING A45 TO AIRPORT WAY CONNECTION REDUCES FROM 2 LANES TO 1 LANE

A45 WB OFFSLIP TO CLOCK I/C TO BE THREE LANES

SIGNAL CONTROL

A45 TO AIRPORT WAY

3RD LANE REQUIRED ON OFFSIDE OF CARRIAGEWAY (20m IN LENGTH)

PROPOSED LINK TO AIRPORT WAY

PROPOSED DUAL CARRIAGEWAY TO BIRMINGHAM AIRPORT/A45

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P02	ROAD MARKINGS ADDED TO CLOCK INTERCHANGE & ALIGNMENT OF PEDESTRIAN FOOTBRIDGE UPDATED. MINOR NOTE ALTERATIONS.	JC	DM	GM	JUN 17

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
CLOCK INTERCHANGE GENERAL ARRANGEMENT DRAWING

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Scale	Designed / Drawn	Checked	Approved	Authorised
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Original Size: A1	Date: JUN 17	Date: JUN 17	Date: JUN 17	Date: JUN 17

Status: SUITABLE FOR INFORMATION

Drawing No: Project	Originator	Volume	Suitability
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M42_J6 -	DR -	CH - 0011	Revision: P02
Location	Type	Role	Number

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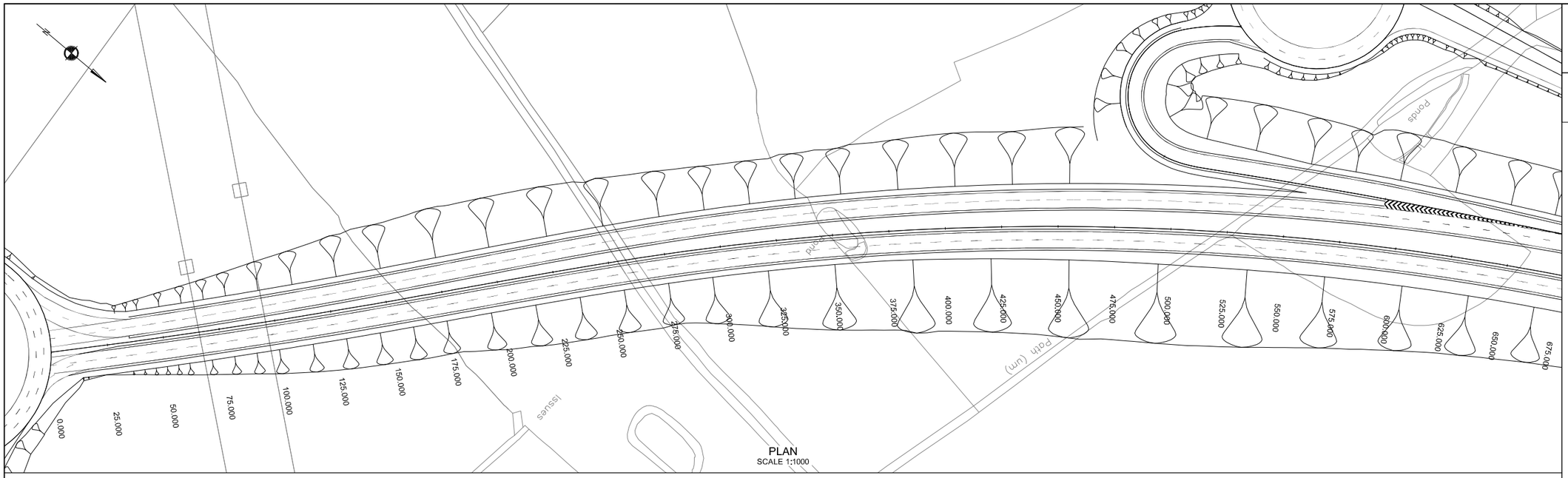
plot date: 06/07/2017 12:21:17
by: Jamie Clift

Appendix B – Option 1 Plan & Profile Drawings

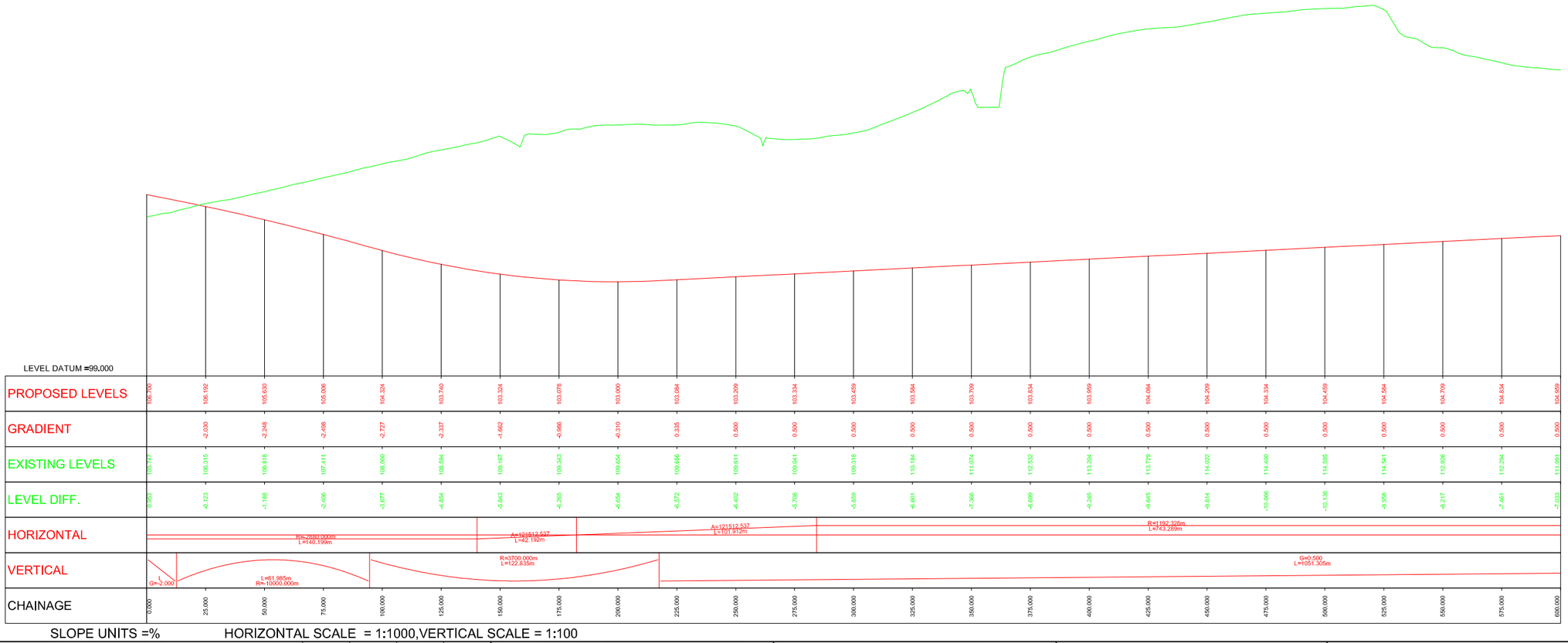
NOTES

1. DO NOT SCALE FROM THIS DRAWING.

KEY



PLAN
SCALE 1:1000



SLOPE UNITS =% HORIZONTAL SCALE = 1:1000,VERTICAL SCALE = 1:100

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
OPTION 1
PROPOSED PLAN AND PROFILE
CH.0 TO CH.600

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building great relationships

Office
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
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Client
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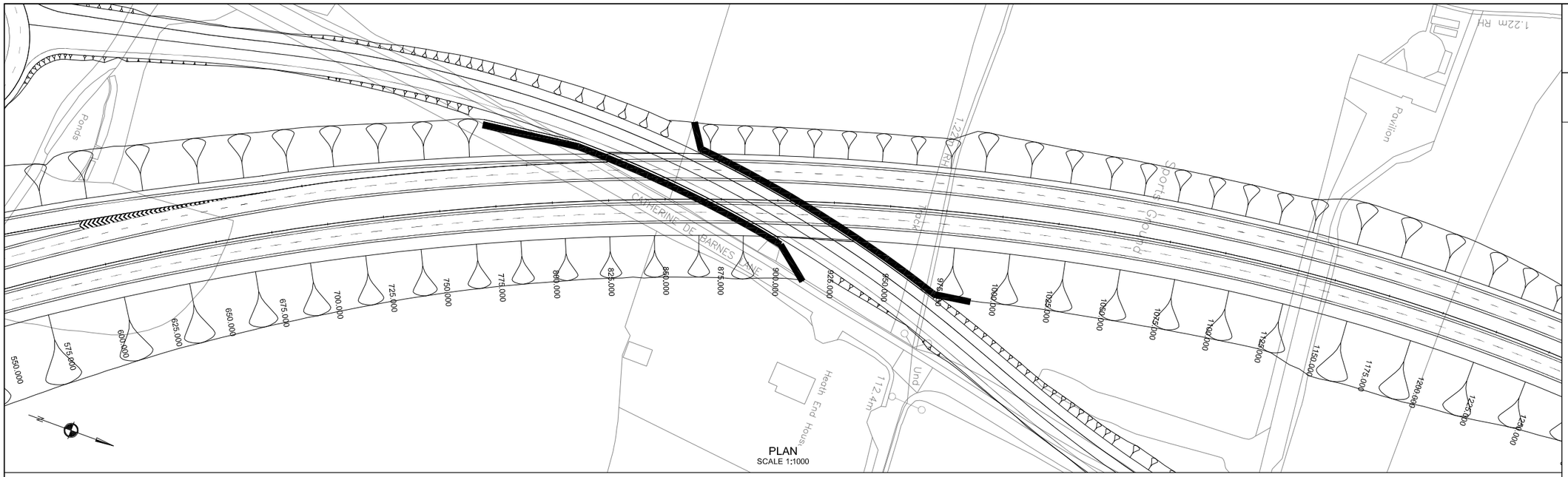
Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	TO	DM	GM	RJ
Original Size: A1	Date: MAY 17	Date: JUN 17	Date: JUN 17	Date: JUN 17

Status: SUITABLE FOR INFORMATION

Drawing No: Project	Originator	Volume	Suitability
HE551485 -	MOU -	HML	S2
M42_J6 -	DR -	CH - 0142	Revision: P01
Location	Type	Role	Number

plot date: 06/07/2017 12:14:44 by: Jamie Gibb
filepath: W:\Highways\TRANSPORT - JOBS\1071038 M42_J6 RIP Stage 1\116 Drawings\Working\DR\Proposed Plan and Profile\Option 1 (Option 2\HE551485-MOU-HML-M42_J6-DR-CH-0142.dwg



PLAN
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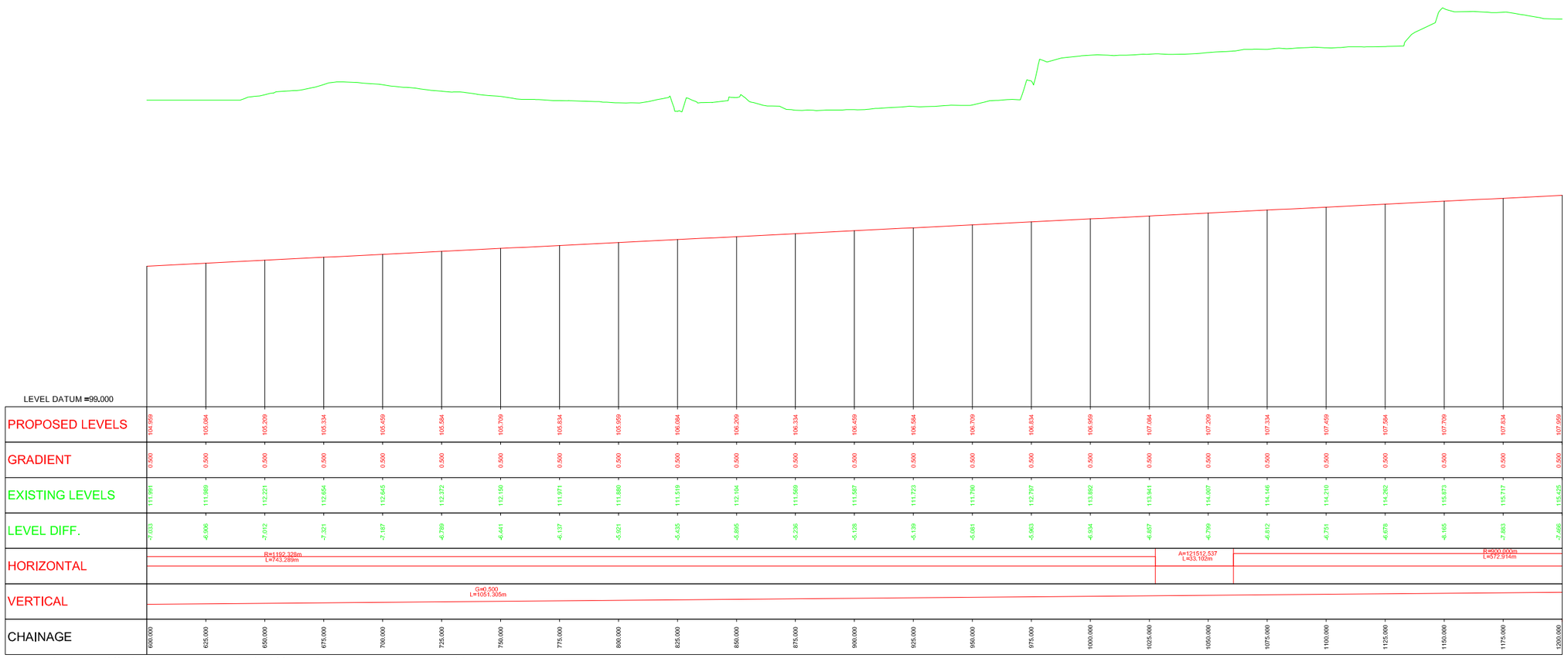

SLOPE UNITS =% HORIZONTAL SCALE = 1:1000,VERTICAL SCALE = 1:100

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NOTES

1. DO NOT SCALE FROM THIS DRAWING.

KEY

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
OPTION 1
PROPOSED PLAN AND PROFILE
CH.600 TO CH.1200

mouchel
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Office
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
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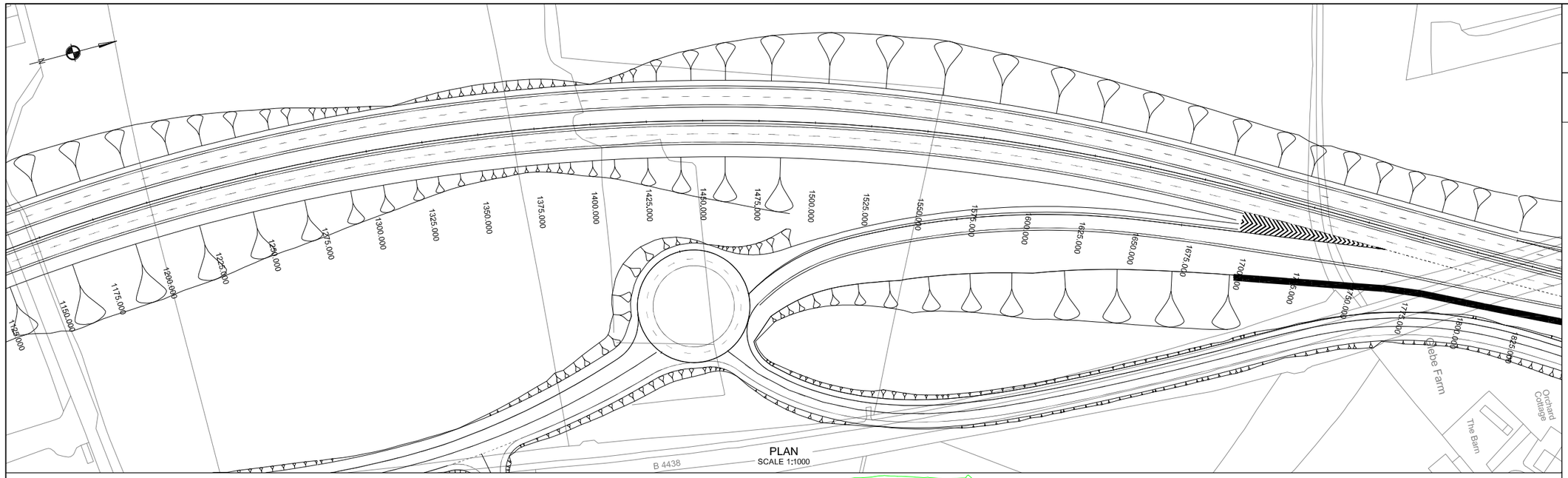
Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	TO	DM	GM	RJ
Original Size	Date	Date	Date	Date
A1	MAY 17	JUN 17	JUN 17	JUN 17

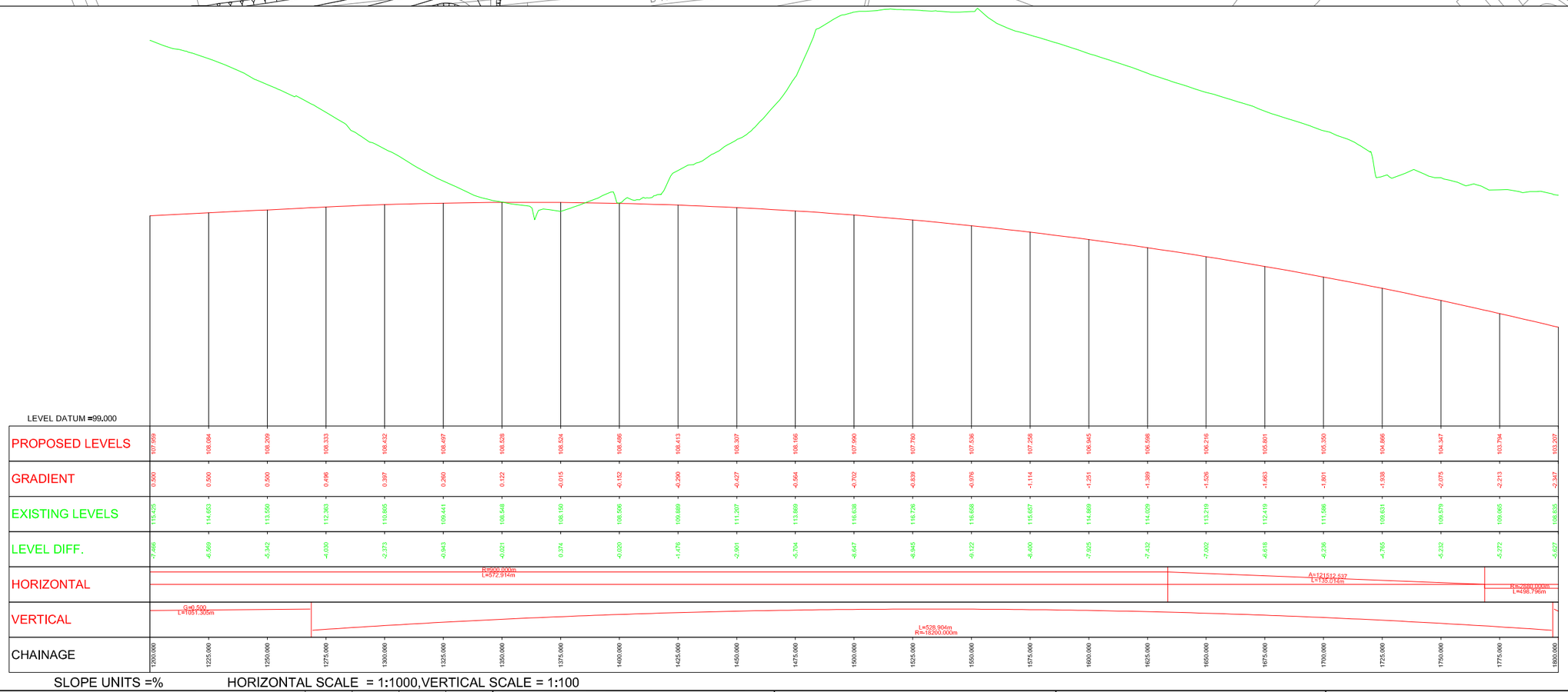
Status: SUITABLE FOR INFORMATION

Drawing No				Suitability
Project	Originator	Volume		S2
HE551485 -	MOU -	HML -		
M42_J6 -	DR -	CH -	0143	Revision
Location	Type	Role	Number	P01

filepath: W:\Highways\TRANSPORT_JOBS\1071038 M42_J6 RIP Stage 1\16 Drawings\16_04 Drawings\Working\DR\Proposed Plan and Profiles\Option 1 (Option 2)\HE551485-MOU-HML-M42_J6-DR-CH-0143.dwg
by: Jamie Clift
plot date: 06/07/2017 12:12:31



PLAN
SCALE 1:1000



SLOPE UNITS =% HORIZONTAL SCALE = 1:1000,VERTICAL SCALE = 1:100

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NOTES

1. DO NOT SCALE FROM THIS DRAWING.

KEY

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
OPTION 1
PROPOSED PLAN AND PROFILE
CH.1200 TO CH.1800

Office
mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
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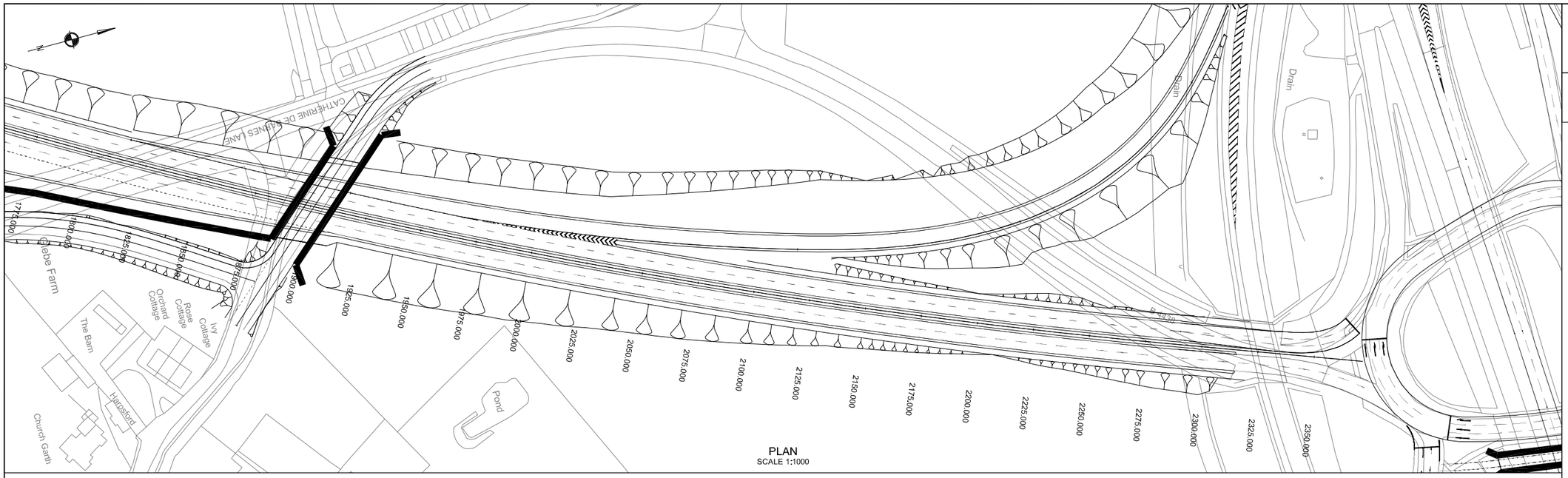
Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	TO	DM	GM	RJ
Original Size	Date	Date	Date	Date
A1	MAY 17	JUN 17	JUN 17	JUN 17

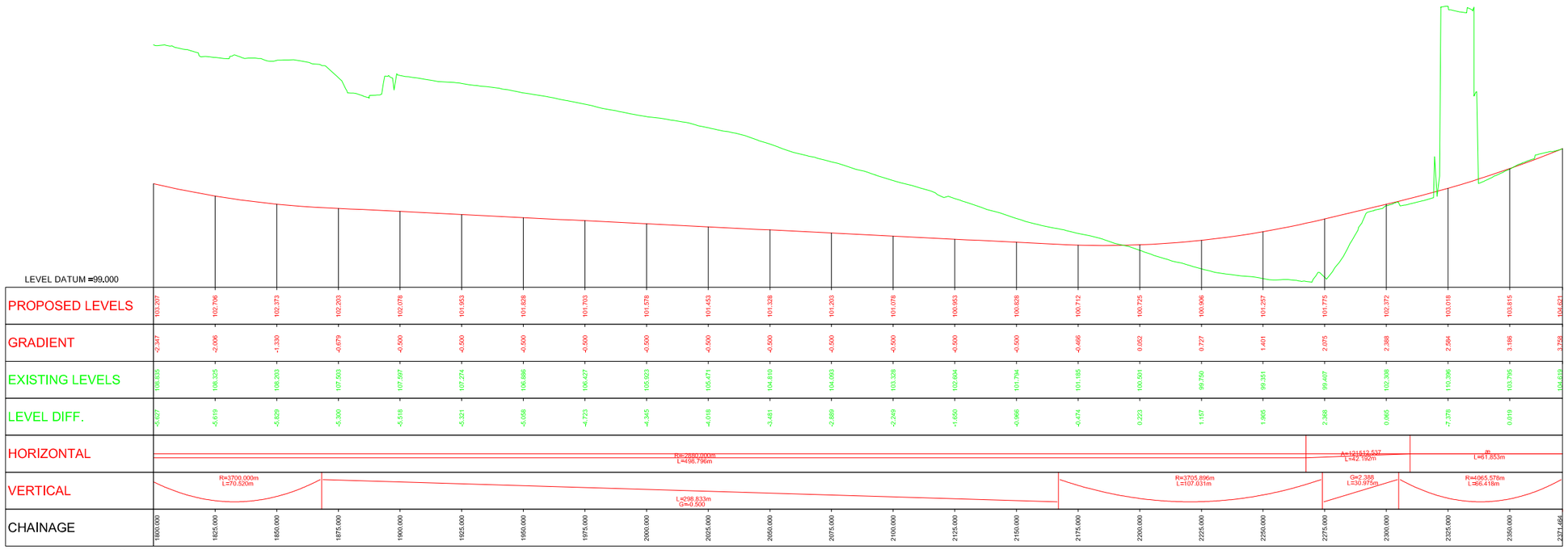
Status
SUITABLE FOR INFORMATION

Drawing No			Suitability
Project	Originator	Volume	S2
HE551485 -	MOU -	HML	
M42_J6 -	DR - CH -	0144	Revision
Location	Type	Role Number	P01

filepath: V:\Highways\TRANSPORT_JOBS\1071038 M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\DR\Proposed Plan and Profiles\Option 1 (Option 2)\HE551485-MOU-HML-M42_J6-DR-CH-0144.dwg
plot date: 06/07/2017 12:11:20 by: Jamie Clift



PLAN
SCALE 1:1000



SLOPE UNITS =% HORIZONTAL SCALE = 1:1000,VERTICAL SCALE = 1:100

NOTES

1. DO NOT SCALE FROM THIS DRAWING.

KEY

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
OPTION 1
PROPOSED PLAN AND PROFILE
CH.1800 TO CH.2371

Office
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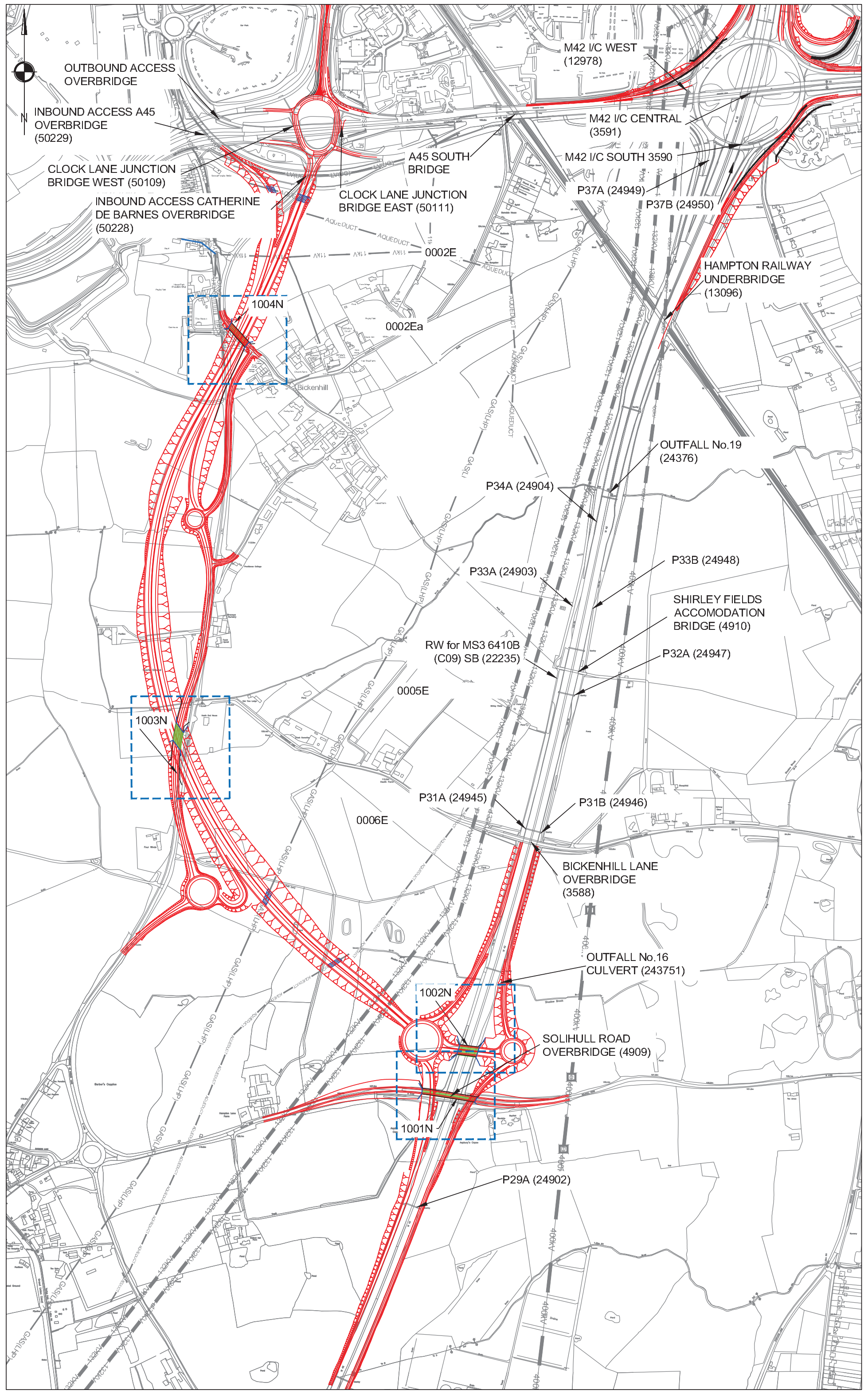
Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	TO	DM	GM	RJ
Original Size	**Date**	**Date**	**Date**	**Date**
A1	MAY 17	JUN 17	JUN 17	JUN 17

Status: SUITABLE FOR INFORMATION

Drawing No				Suitability
Project	Originator	Volume		S2
HE551485 -	MOU	-	HML	
M42_J6 -	DR -	CH -	0145	Revision
Location	Type	Role	Number	P01

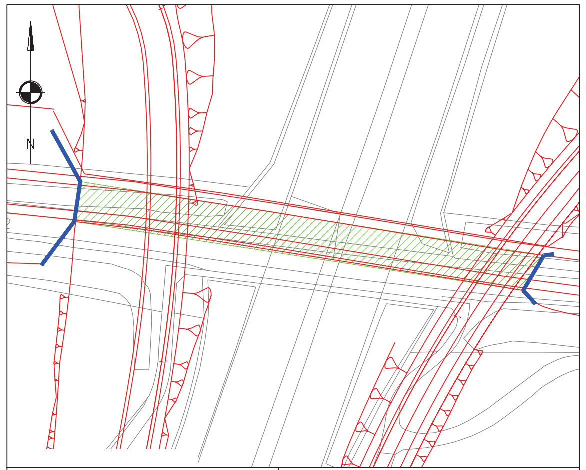
filepath: W:\Highways\TRANSPORT - JOBS\1071038 M42_J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\DR\Proposed Plan and Profile\Option 1 (Option 2R)\HE551485-AXO-HML-M42_J6-DR-CH-0145.dwg
plot date: 06/07/2017 12:10:22
by: Jamie Clift

Appendix C – Structures Drawings



OPTION 1 - PROPOSED ROAD ALIGNMENT

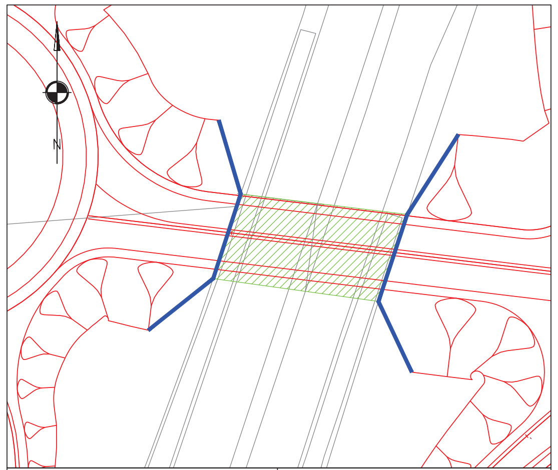
SCALE 1:7500



BRIDGE INFORMATION		CONSTRAINTS
WIDTH:	13m APPROX.	ENVIRONMENT: NO PRoW: NO GEO HAZARD: ALUMINIUM / GEO-DEFECTS HS2 INFO: NO STATS CHECK: NO
SPAN:	134m APPROX.	
SKEW:	11° APPROX.	

STRUCTURE REF 1001N - O/B

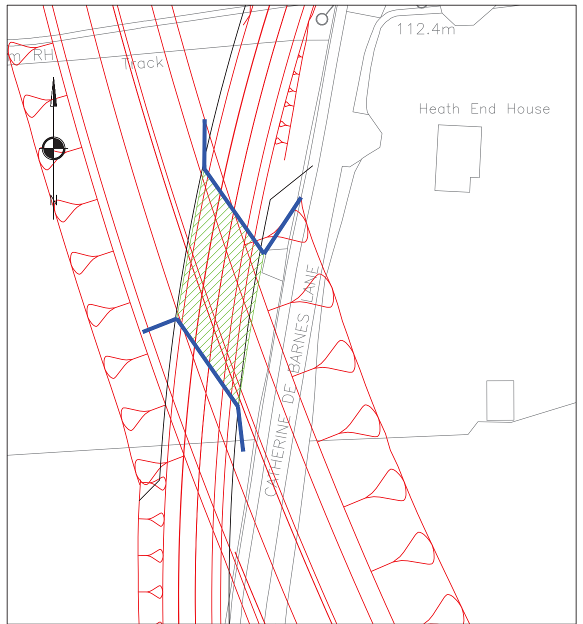
SCALE 1:1000



BRIDGE INFORMATION		CONSTRAINTS
WIDTH:	25m APPROX.	ENVIRONMENT: NO PRoW: YES/SHARED USE GEO HAZARD: ALUMINIUM HS2 INFO: NO STATS CHECK: NO
SPAN:	50m APPROX.	
SKEW:	11° APPROX.	

STRUCTURE REF 1002N - O/B

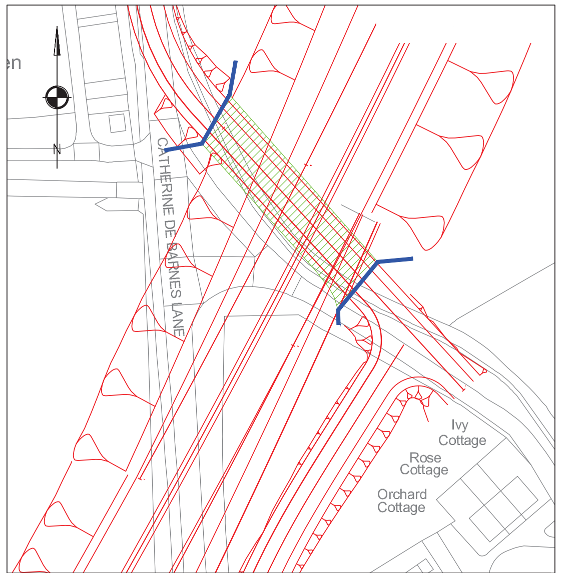
SCALE 1:1000



BRIDGE INFORMATION		CONSTRAINTS
WIDTH:	21m APPROX.	ENVIRONMENT: NO PRoW:YES/SHARED NO GEO HAZARD: GLACIOFLUVIAL HS2 INFO: NO STATS CHECK: NO
SPAN:	43m APPROX.	
SKEW:	19° APPROX.	

STRUCTURE REF 1003N - U/B

SCALE 1:1000



BRIDGE INFORMATION		CONSTRAINTS
WIDTH:	15m APPROX.	ENVIRONMENT: NO PRoW: NO GEO HAZARD: NO HS2 INFO: NO STATS CHECK: LV(OH)
SPAN:	63m APPROX.	
SKEW:	21° APPROX.	

STRUCTURE REF 1004N - U/B

SCALE 1:1000

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. DIMENSIONS OF STRUCTURE TO BE CONFIRMED AT PRELIMINARY DESIGN STAGE.
3. SKEW IS TAKEN PERPENDICULAR TO THE BRIDGE AT THE INTERSECTION OF THE WIDTH AND LENGTH OF THE STRUCTURE.
4. COVER PLATES ARE USED TO PROTECT THE SERVICE PIPES FROM THE TRAFFIC LOAD.
5. THERE WILL BE FOUR NEW STRUCTURES REQUIRED TO FORM THE PROPOSED ROAD ALIGNMENT. THESE ARE:
   1001N
   1002N
   1003N
   1004N
6. THERE WILL BE SEVEN EXISTING STRUCTURES WHICH WILL BE AFFECTED BY THIS OPTION;
   CLOCK LANE JUNCTION BRIDGE WEST (50109)
   INBOUND ACCESS CATHERINE DE BARNES OVERBRIDGE (50228)
   CLOCK LANE JUNCTION BRIDGE EAST (50111)
   BICKENHILL LANE OVERBRIDGE (3588)
   OUTFALL No. 16 CULVERT (243751)
   SOLIHULL ROAD OVERBRIDGE (4909)
   P29A (24902)

KEY

- PROPOSED BRIDGE STRUCTURE/BRIDGE DECK
- PROPOSED EMBANKMENTS/ CUTTINGS COMBINED
- GAS (LHP)
- AQUEDUCT
- 132 kV ELECTRICITY
- 400 kV ELECTRICITY
- STATS PROTECTIVE COVER PLATE
- PROPOSED RETAINING WALLS & ABUTMENTS

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project: **WEST MIDLANDS AREA 9 M42 JUNCTION 6 IMPROVEMENTS**

Drawing Title: **PLAN VIEW OF NEW STRUCTURES FOR OPTION 1 - OUTLINE DESIGN**

Office: mouchel building great relationships
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8949
Fax: 0121 355 8901
www.mouchel.com

Client: Working on behalf of highways england

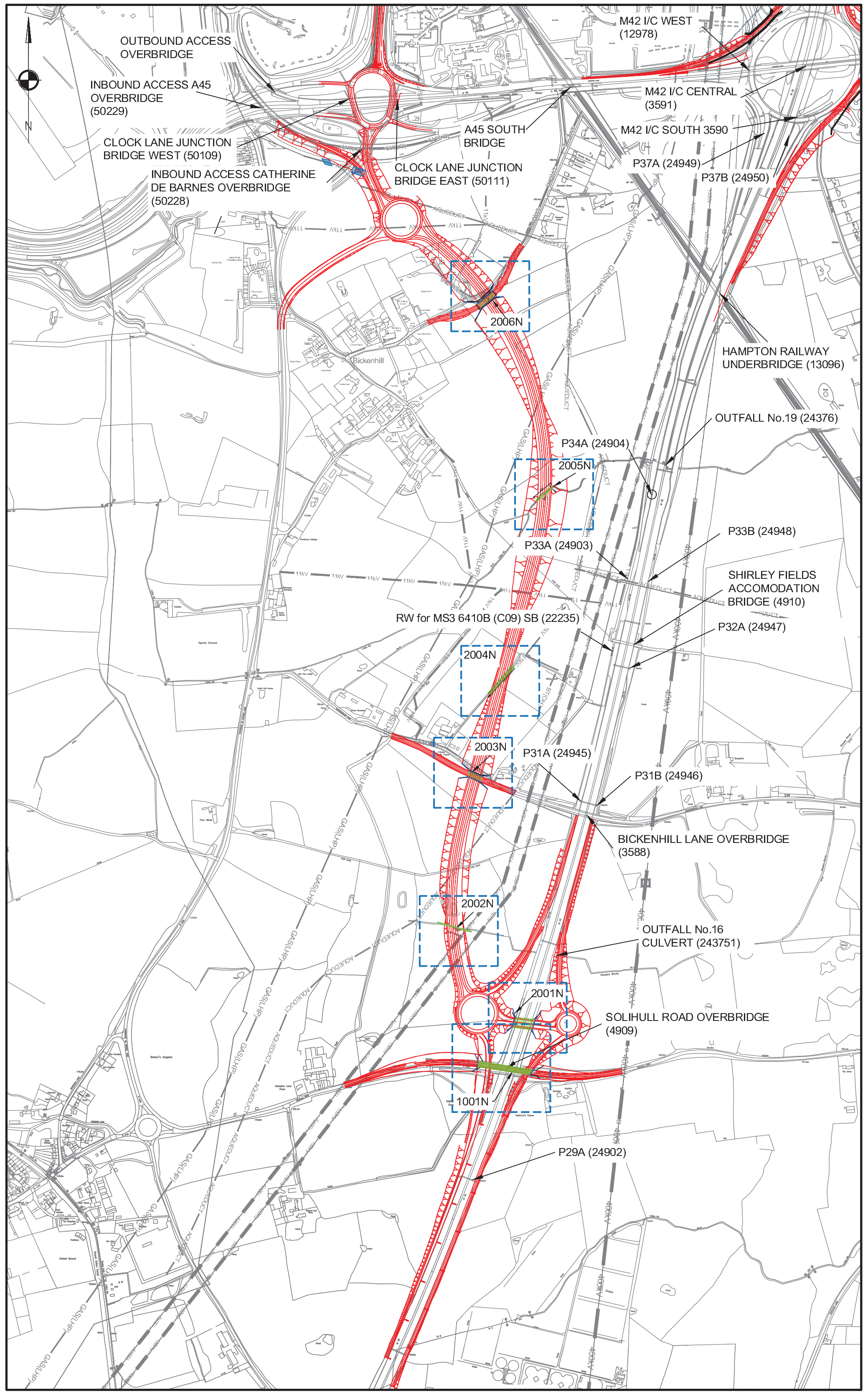
Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	KT	SQ	GP	GM
Original Size: A1	Date: 30/05/17	Date: 30/05/17	Date: 30/05/17	Date: 13/06/17

Status: WORK IN PROGRESS

Drawing No: HE551485 - MOU - GEN M42_J6 - DR - CB - 0001 (Project / Originator / Volume / Location / Type / Role / Number)

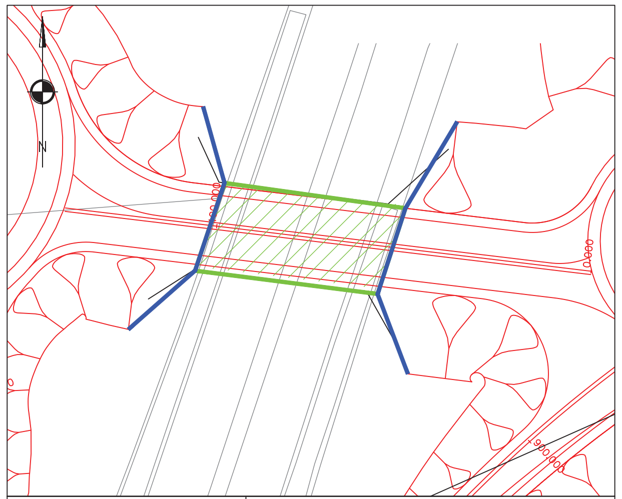
Suitability: S0

Revision: P01



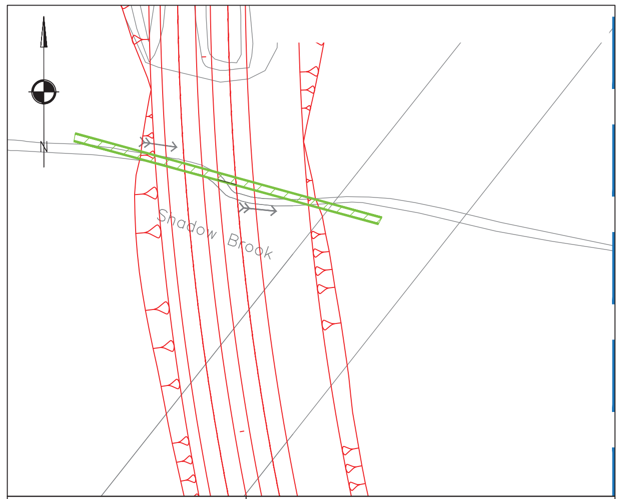
OPTION 2 - PROPOSED ROAD ALIGNMENT

SCALE 1:7500



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 25m APPROX LENGTH: 49m APPROX SKEW: 12° APPROX	ENVIRONMENT: NO PRoW: NO GEO HAZARD: ALUMINIUM / GEO-DEFECTS HS2 INFO: NO STATS CHECK: NO

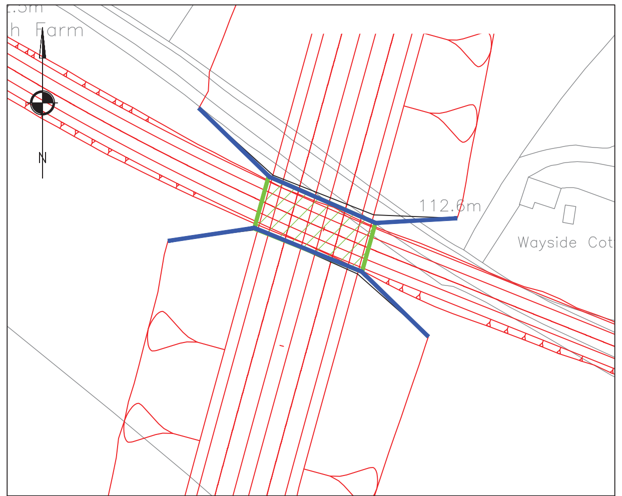
STRUCTURE REF 2001N - O/B



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 2m APPROX LENGTH: 42m APPROX SKEW: 20° APPROX	ENVIRONMENT: WATERCOURSE PRoW: NO GEO HAZARD: ALUMINIUM/OTHER HAZZARD (POTENTIAL) HS2 INFO: NO STATS CHECK: NO

STRUCTURE REF 2002N - CULVERT

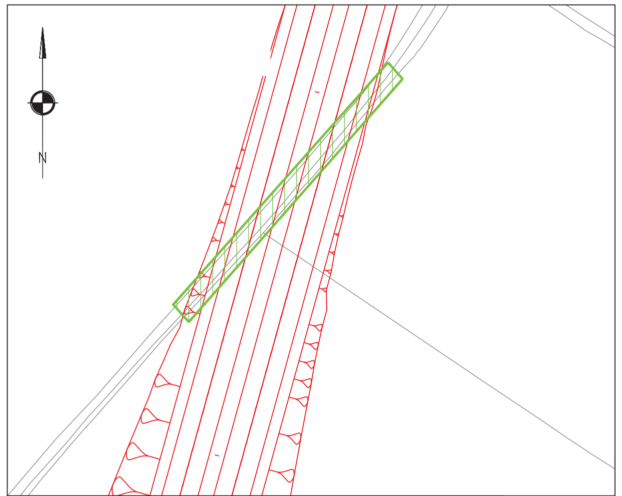
SCALE 1:1000



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 29m APPROX LENGTH: 15m APPROX SKEW: 9° APPROX	ENVIRONMENT: NO PRoW: ADVISORY ROUTE GEO HAZARD:GLACIOFLUVIAL SAND & GRAVEL (POTENTIAL) HS2 INFO: NO STATS CHECK: YES LV(UG)

STRUCTURE REF 2003N - O/B

SCALE 1:1000



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 6m APPROX LENGTH: 86m APPROX SKEW: 64° APPROX	ENVIRONMENT: NO PRoW: NO GEO HAZARD:GLACIOFLUVIAL SAND & GRAVEL (POTENTIAL) HS2 INFO: NO STATS CHECK: YES 11kV

STRUCTURE REF 2004N - CULVERT

SCALE 1:1000

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. DIMENSIONS OF STRUCTURE TO BE CONFIRMED AT PRELIMINARY DESIGN STAGE.
3. SKEW IS TAKEN PERPENDICULAR TO THE BRIDGE AT THE INTERSECTION OF THE WIDTH AND LENGTH OF THE STRUCTURE.
4. COVER PLATES ARE USED TO PROTECT THE SERVICE PIPES FROM THE TRAFFIC LOAD.
5. THERE ARE SEVEN NEW STRUCTURES REQUIRED TO FORM THE PROPOSED ROAD ALIGNMENT. THESE ARE:
   1001N
   2001N
   2002N
   2003N
   2004N
   2005N
   2006N
6. THERE WILL BE SEVEN EXISTING STRUCTURES WHICH WILL BE AFFECTED BY THIS OPTION.
   CLOCK LANE JUNCTION BRIDGE WEST (50109)
   INBOUND ACCESS CATHERINE DE BARNES OVERBRIDGE (50228)
   CLOCK LANE JUNCTION BRIDGE EAST (50111)
   BICKENHILL LANE OVERBRIDGE (3588)
   OUTFALL No.16 CULVERT (243751)
   SOLIHULL ROAD OVERBRIDGE (4909)
   P29A (24902)

KEY

- PROPOSED BRIDGE STRUCTURE, TUNNEL STRUCTURE OR BOX CULVERT
- PROPOSED EMBANKMENTS/ CUTTINGS COMBINED
- GAS (LHP)
- AQUEDUCT
- 132 kV ELECTRICITY
- 400 kV ELECTRICITY
- 11 kV ELECTRICITY
- STATS PROTECTIVE COVER PLATE
- PROPOSED RETAINING WALLS & ABUTMENTS

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project: WEST MIDLANDS AREA 9 M42 JUNCTION 6 IMPROVEMENTS

Drawing Title: PLAN VIEW OF NEW STRUCTURES FOR OPTION 2 - OUTLINE DESIGN PART 1

mouchel building great relationships

Office: KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH Tel: 0121 355 8949 Fax: 0121 355 8901 www.mouchel.com

Client: Working on behalf of highways england

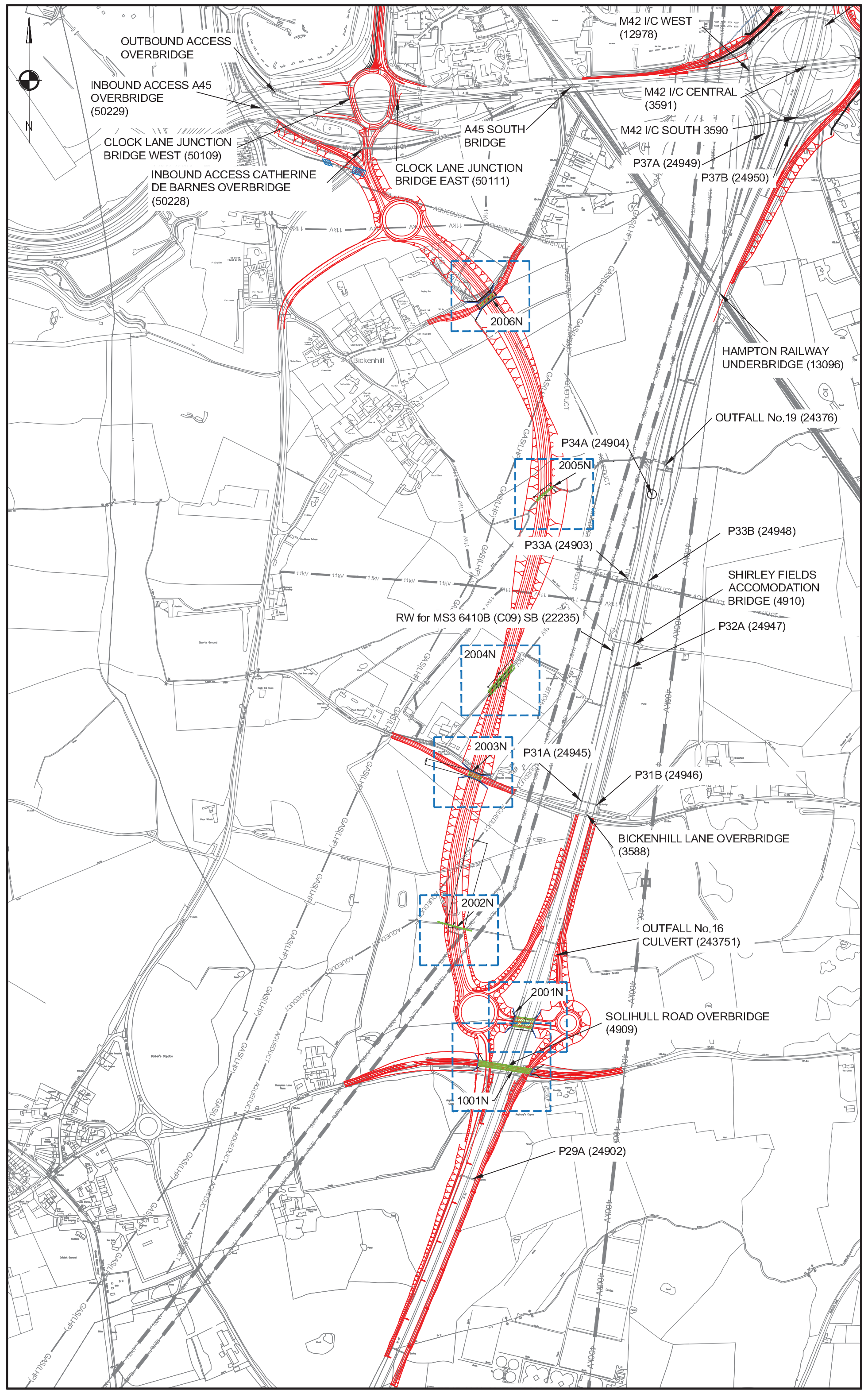
Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	KT	SQ	GP	GM
Original Size: A1	Date: 30/05/17	Date: 30/05/17	Date: 30/05/17	Date: 13/06/17

Status: WORK IN PROGRESS

Drawing No: HE551485 - MOU - GEN / M42_J6 - DR - CB - 0002 (Project / Originator / Volume / Location / Type / Role / Number)

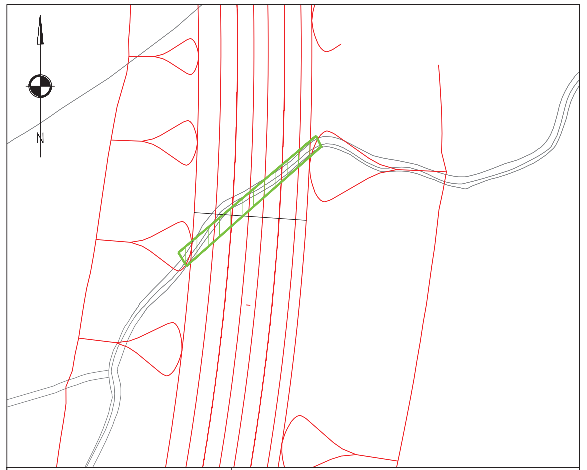
Suitability: S0

Revision: P01



OPTION 2 - PROPOSED ROAD ALIGNMENT

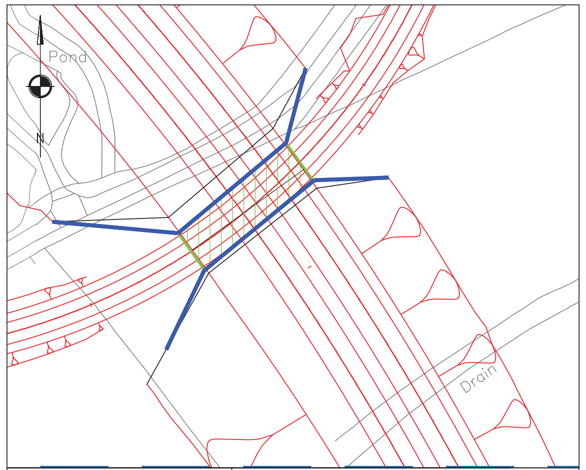
SCALE 1:7500



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 4m APPROX LENGTH: 53m APPROX SKEW: 46° APPROX	ENVIRONMENT: WATERCOURSE PRoW: NO GEO HAZARD: LANDFILL (BORDER) HS2 INFO: NO STATS CHECK: NO

STRUCTURE REF 2005N - CULVERT

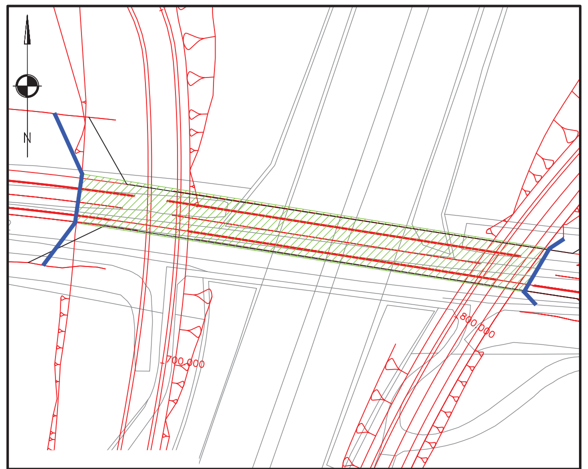
SCALE 1:1000



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 40m APPROX LENGTH: 13m APPROX SKEW: 5° APPROX	ENVIRONMENT: NO PRoW: NO GEO HAZARD: EXISTING PATHS - RIGHT OF WAY & GREEN MAN ROUTE HS2 INFO: NO STATS CHECK: YES LV(OH)

STRUCTURE REF 2006N -O/B

SCALE 1:1000



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 13m APPROX. SPAN: 134m APPROX. SKEW: 11° APPROX.	ENVIRONMENT: NO PRoW: NO GEO HAZARD: ALUMINIUM / GEO-DEFECTS HS2 INFO: NO STATS CHECK: NO

STRUCTURE REF 1001N - O/B

SCALE 1:1000

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. DIMENSIONS OF STRUCTURE TO BE CONFIRMED AT PRELIMINARY DESIGN STAGE.
3. SKEW IS TAKEN PERPENDICULAR TO THE BRIDGE AT THE INTERSECTION OF THE WIDTH AND LENGTH OF THE STRUCTURE.
4. COVER PLATES ARE USED TO PROTECT THE SERVICE PIPES FROM THE TRAFFIC LOAD.
5. THERE ARE SEVEN NEW STRUCTURES REQUIRED TO FORM THE PROPOSED ROAD ALIGNMENT. THESE ARE:
   1001N
   2001N
   2002N
   2003N
   2004N
   2005N
   2006N
6. THERE WILL BE SEVEN EXISTING STRUCTURES WHICH WILL BE AFFECTED BY THIS OPTION.
   CLOCK LANE JUNCTION BRIDGE WEST (50109)
   INBOUND ACCESS CATHERINE DE BARNES OVERBRIDGE (50228)
   CLOCK LANE JUNCTION BRIDGE EAST (50111)
   BICKENHILL LANE OVERBRIDGE (3588)
   OUTFALL No.16 CULVERT (243751)
   SOLIHULL ROAD OVERBRIDGE (4909)
   P29A (24902)

KEY

- PROPOSED BRIDGE STRUCTURE, TUNNEL STRUCTURE OR BOX CULVERT
- PROPOSED EMBANKMENTS/ CUTTINGS COMBINED
- GAS (LHP)
- AQUEDUCT
- 132 kV ELECTRICITY
- 400 kV ELECTRICITY
- 11 kV ELECTRICITY
- STATS PROTECTIVE COVER PLATE
- PROPOSED RETAINING WALLS & ABUTMENTS

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project: WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title: PLAN VIEW OF NEW STRUCTURES FOR OPTION 2 - OUTLINE DESIGN PART 2

Office: mouchel — building great relationships
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Fax: 0121 355 8901
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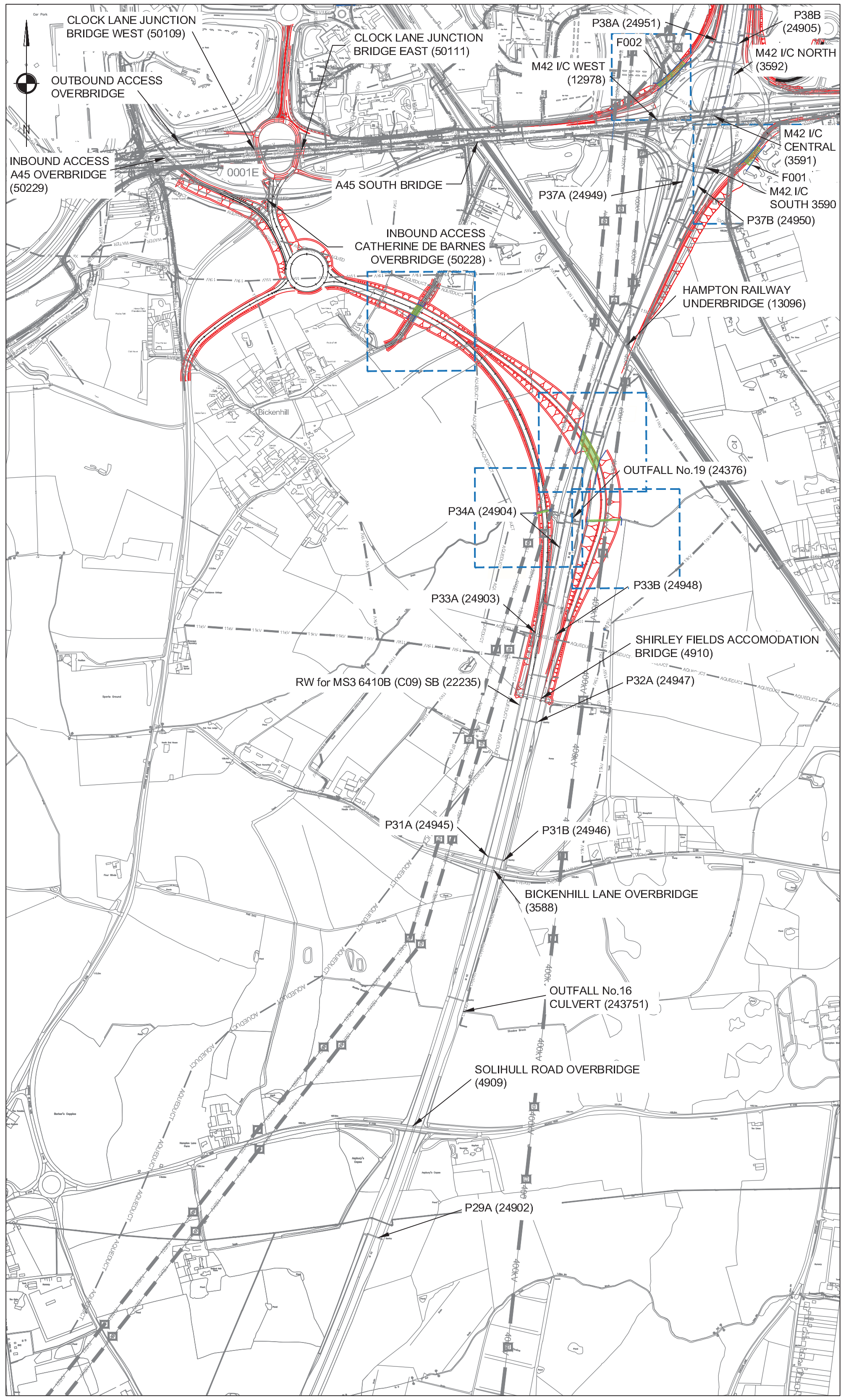
Client: Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	KT	SQ	GP	GM
Original Size: A1	Date: 30/05/17	Date: 30/05/17	Date: 30/05/17	Date: 13/06/17

Status: WORK IN PROGRESS

Drawing No: HE551485 - MOU - GEN (Project / Originator / Volume)
M42_J6 - DR - CB - 0003 (Location / Type / Role / Number)

Suitability: S0
Revision: P01



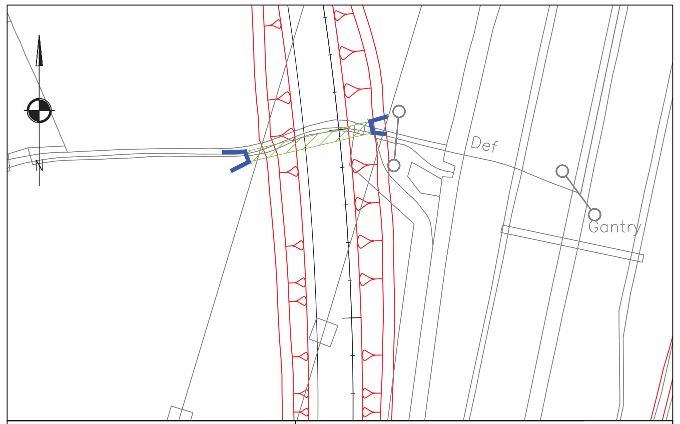
OPTION 3 - PROPOSED ROAD ALIGNMENT

SCALE 1:7500

BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 5m APPROX LENGTH: 83m APPROX SKEW: 20° APPROX	ENVIRONMENT: EXISTING WATERWAYS PRoW: NO GEO HAZARD: ALUMINIUM HS2 INFO: NO STATS CHECK: NO

STRUCTURE REF 3001N - CULVERT

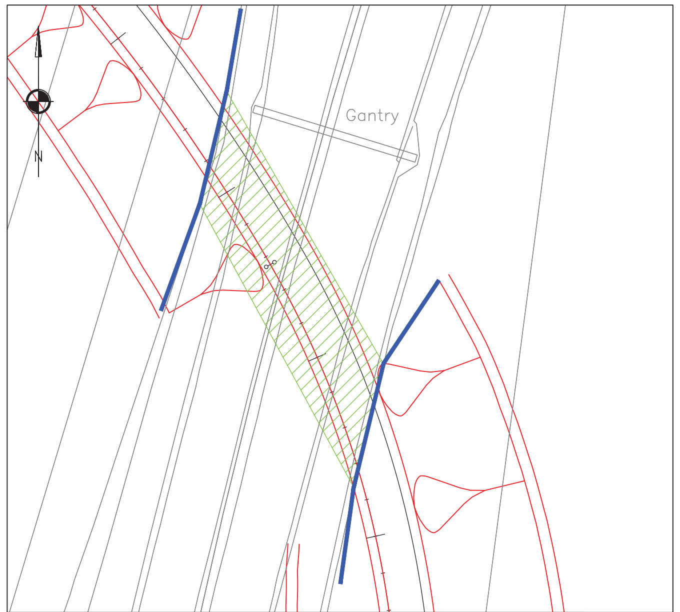
SCALE 1:1000



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 3m APPROX LENGTH: 34m APPROX SKEW: 2° APPROX	ENVIRONMENT: EXISTING WATERWAYS PRoW: NO GEO HAZARD: ALUMINIUM (POTENTIAL) HS2 INFO: NO STATS CHECK: NO

STRUCTURE REF 3002N - CULVERT

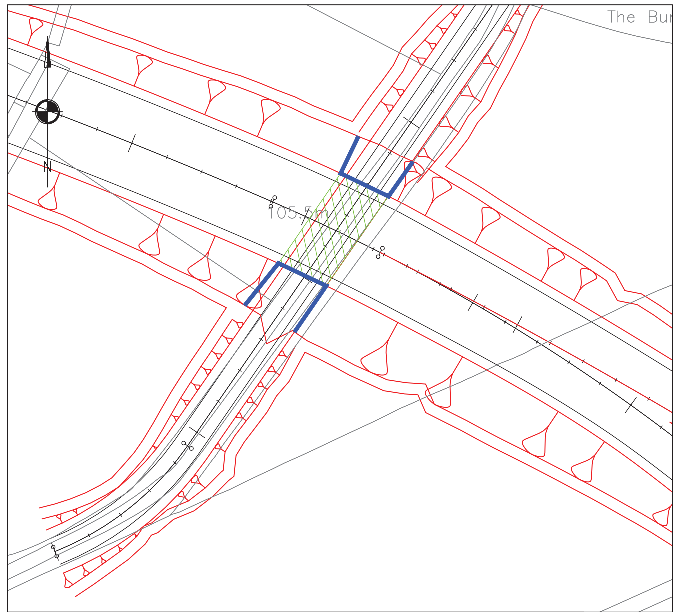
SCALE 1:1000



BRIDGE INFORMATION	CONSTRAINTS
SPAN: 23m APPROX LENGTH: 87m APPROX SKEW: 48° APPROX	ENVIRONMENT: NO PRoW: NO GEO HAZARD: GEOTECHNICAL DEFECTS HS2 INFO: NO STATS CHECK:

STRUCTURE REF 3003N - O/B

SCALE 1:1000



BRIDGE INFORMATION	CONSTRAINTS
SPAN: 14m APPROX LENGTH: 29m APPROX SKEW: 10° APPROX	ENVIRONMENT: NO PRoW: NO GEO HAZARD: NO HS2 INFO: NO STATS CHECK: LV (OH), 11kV

STRUCTURE REF 3004N - U/B

SCALE 1:1000

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. DIMENSIONS OF STRUCTURE TO BE CONFIRMED AT PRELIMINARY DESIGN STAGE.
3. SKEW IS TAKEN PERPENDICULAR TO THE BRIDGE AT THE INTERSECTION OF THE WIDTH AND LENGTH OF THE STRUCTURE.
4. COVER PLATES ARE USED TO PROTECT THE SERVICE PIPES FROM THE TRAFFIC LOAD.
5. THERE WILL BE FOUR NEW STRUCTURES REQUIRED TO FORM THE PROPOSED ROAD ALIGNMENT. THESE ARE:
   3001N
   3002N
   3003N
   3004N
6. THERE WILL BE EIGHT EXISTING STRUCTURES WHICH WILL BE AFFECTED BY THIS OPTION.
   CLOCK LANE JUNCTION BRIDGE WEST (50109)
   CLOCK LANE JUNCTION BRIDGE EAST (50111)
   INBOUND ACCESS CATHERINE DE BARNES OVERBRIDGE (50228)
   OUTFALL No.19 (24376)
   P34A (24904)
   P33A (24903)
   P33B (24948)
   SHIRLEY FIELDS ACCOMMODATION BRIDGE (4910)

KEY

- PROPOSED BRIDGE STRUCTURE
- PROPOSED EMBANKMENT/ CUTTINGS COMBINED
- WATER MAIN STW
- ABANDONED WATER PIPE
- BT UNDERGROUND
- GAS (LHP)
- AQUEDUCT
- 132 kV ELECTRICITY
- 400 kV ELECTRICITY
- PROPOSED RETAINING WALLS & ABUTMENT

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project: **WEST MIDLANDS AREA 9 M42 JUNCTION 6 IMPROVEMENTS**

Drawing Title: **PLAN VIEW OF NEW STRUCTURES FOR OPTION 3 - OUTLINE DESIGN**

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KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
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Client: Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	KT	SQ	GP	GM
Original Size A1	Date 30/05/17	Date 30/05/17	Date 30/05/17	Date 13/06/17

Status: WORK IN PROGRESS

Drawing No: HE551485 - MOU - GEN - M42_J6 - DR - CB - 0004 (Project / Originator / Volume / Location / Type / Role / Number)

Suitability: S0

Revision: P01

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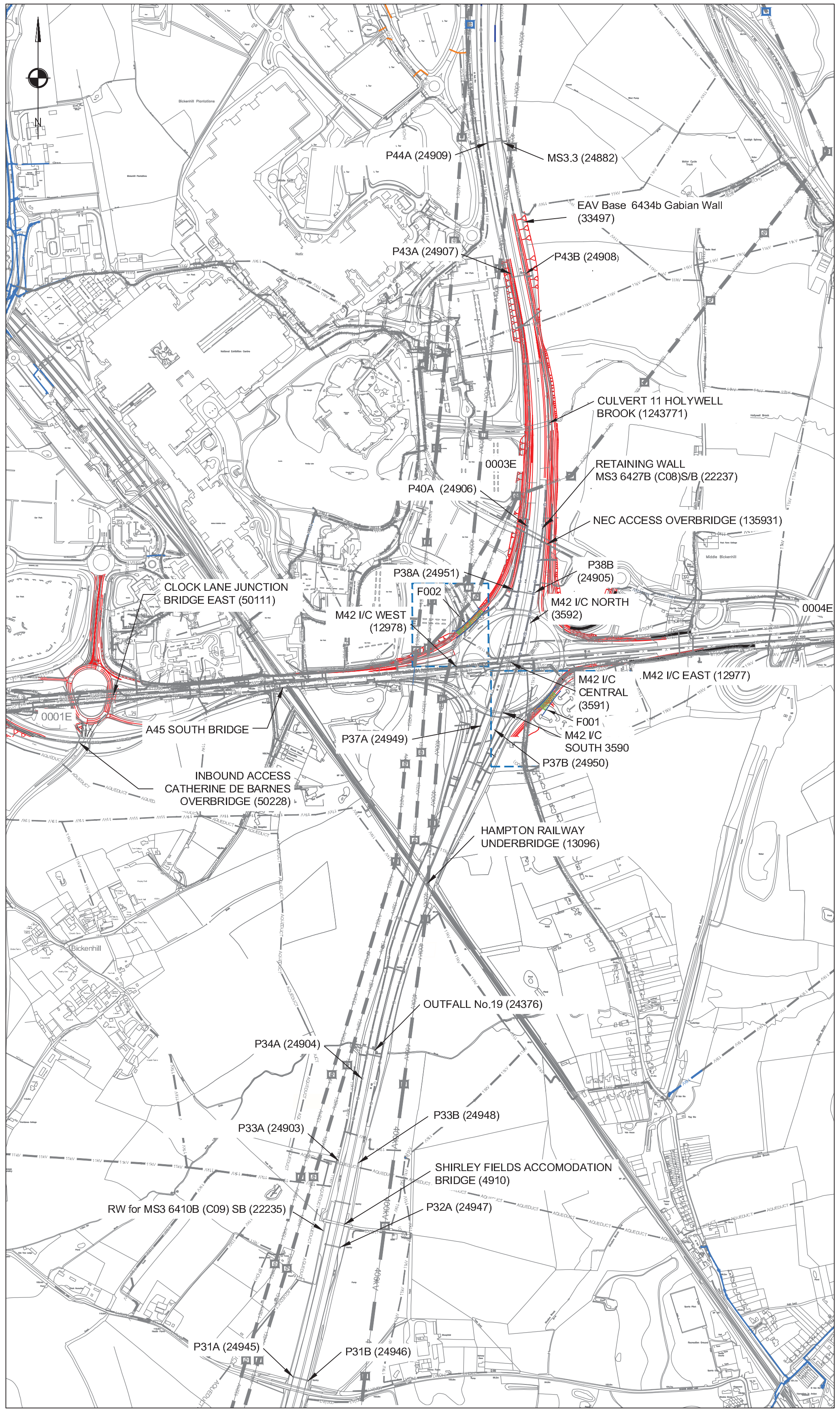
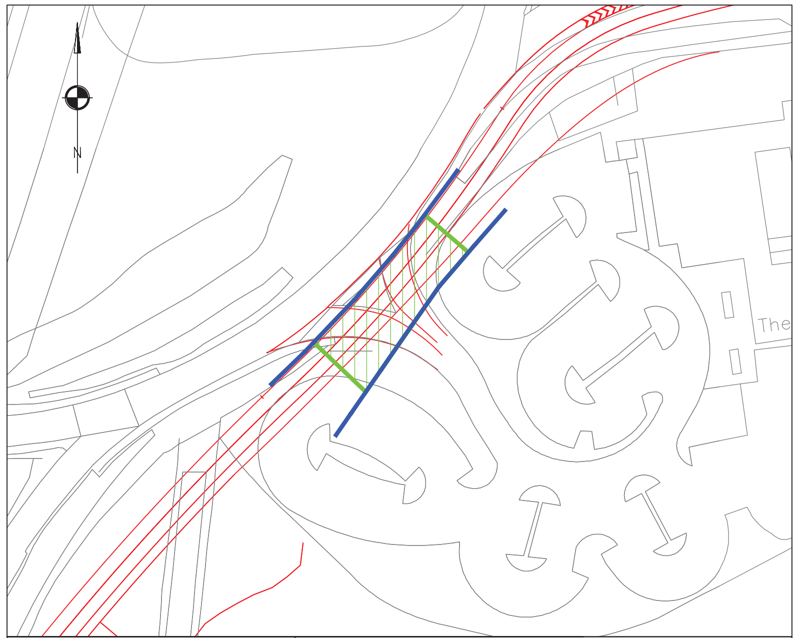
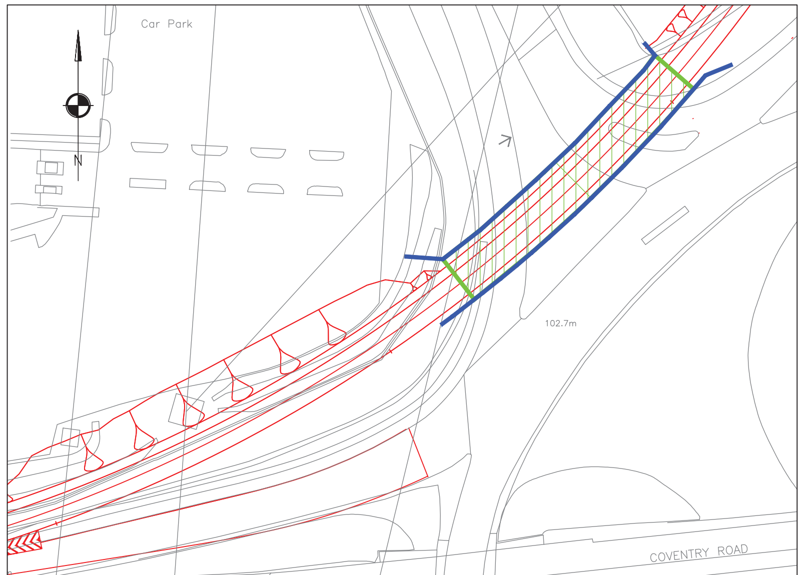


OPTION OF FREE FLOW LINKS
PROPOSED ROAD ALIGNMENT
SCALE 1:7500



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 19m APPROX LENGTH: 46m APPROX SKEW: 39° APPROX	ENVIRONMENT: NO PRoW: EXISTING PATHS - RIGHTS OF WAY GENERAL GEO HAZARD: MADE GROUND HS2 INFO: NO STATS CHECK: 11kV; GAS (MP); BT(UG); WATER; LV(UG)

STRUCTURE REF F001N - U/B
SCALE 1:1000



BRIDGE INFORMATION	CONSTRAINTS
WIDTH: 13m APPROX LENGTH: 81m APPROX SKEW: 59° APPROX	ENVIRONMENT: NO PRoW: NATIONAL CYCLE NETWORK GEO HAZARD: MADE GROUND HS2 INFO: NO STATS CHECK: 11 kV; GAS (MP); BT (UG); WATER; LV (UG)

STRUCTURE REF F002N - U/B
SCALE 1:1000

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. DIMENSIONS OF STRUCTURE TO BE CONFIRMED AT PRELIMINARY DESIGN STAGE..
3. SKEW IS TAKEN PERPENDICULAR TO THE BRIDGE AT THE INTERSECTION OF THE WIDTH AND LENGTH OF THE STRUCTURE.
4. COVER PLATES ARE USED TO PROTECT THE SERVICE PIPES FROM THE TRAFFIC LOAD.
5. THERE ARE TWO NEW STRUCTURES REQUIRED TO FORM THE PROPOSED ROAD ALIGNMENT. THESE ARE:
   F001N
   F002N
6. THERE WILL BE NINE EXISTING STRUCTURES WHICH WILL BE AFFECTED BY THIS OPTION.
   EAV BASE 6434b GABIAN WALL (33497)
   P43A (24907)
   P43B (24908)
   CULVERT 11 HOLYWELL BROOK (1243771)
   RETAINING WALL MS3 6427B (C08)S/B (22237)
   P40A (24906)
   NEC ACCESS OVERBRIDGE (135931)
   P38B (24905)
   P38A (24951)

KEY

- PROPOSED BRIDGE STRUCTURE
- PROPOSED EMBANKMENT/ CUTTINGS COMBINED
- WATER MAIN STW
- ABANDONED WATER PIPE
- BT (UG)
- GAS (LHP)
- AQUEDUCT
- 132 kV ELECTRICITY
- 400 kV ELECTRICITY
- PROPOSED RETAINING WALLS & ABUTMENTS

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project: WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title: PLAN VIEW OF NEW STRUCTURES FOR FREE FLOW LINK OPTION OUTLINE DESIGN

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Client: Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
AS SHOWN	KT	SQ	GP	GM
Original Size: A1	Date: 30/05/17	Date: 30/05/17	Date: 30/05/17	Date: 13/06/17

Status: WORK IN PROGRESS

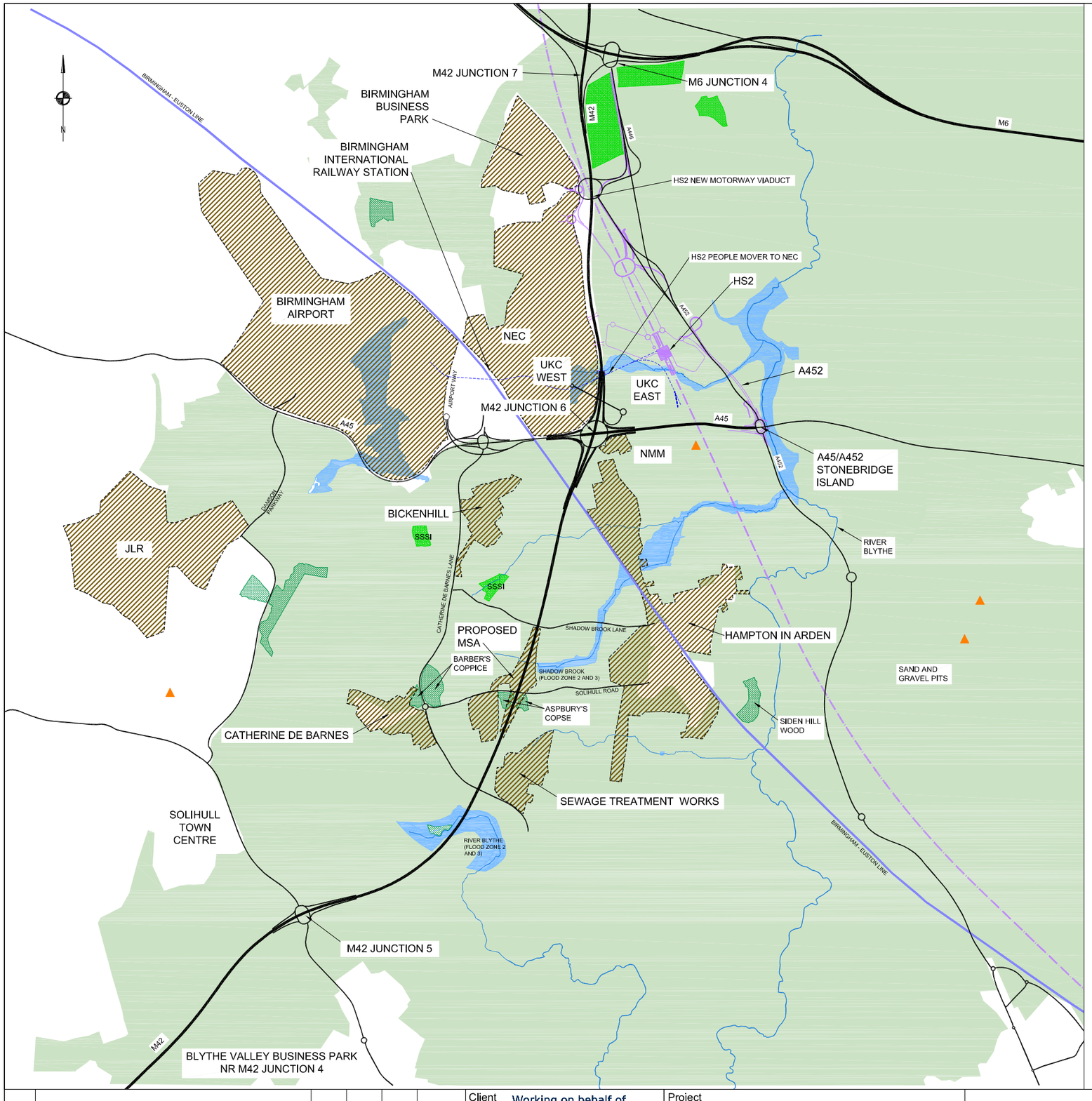
Drawing No: HE551485 - MOU - GEN
M42_J6 - DR - CB - 0005
(Project / Originator / Volume / Location / Type / Role / Number)

Suitability: S0
Revision: P01

filepath: W:\Highways\TRANSPORT JOBS\1071638 M42 J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\STRUCTURES\HE551485-MOU-GEN-M42_J6-DR-CB-0004 & 0005-OPTION 3 AND FREE FLOW.dwg

by: Emma Luckman
plot date: 15/06/2017 09:57:53

Appendix D – Constraint Plans



STAKEHOLDER NOTES AND KEY FIGURES

BIRMINGHAM BUSINESS PARK
- 9 HECTARE SITE SOUTH WEST OF THE BUSINESS PARK ALLOCATED FOR DEVELOPMENT - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).

NATIONAL EXHIBITION CENTRE (NEC)
- IT HAS BEEN ESTIMATED THAT THE RESORTS WORLD SCHEME WILL GENERATE 1,710 NET ADDITIONAL CONSTRUCTION JOBS DURING ITS DEVELOPMENT PHASE AND 1,100 OPERATIONAL JOBS AND THAT IT WILL GENERATE AN ADDITIONAL £25.5 MILLION OF ECONOMIC OUTPUT PER ANNUM. THE PLANNED OPENING IS 2015 - SOURCE SMBC M42 ECONOMIC GATEWAY MASTERPLAN REPORT (JUNE 2013).
- NOW RESORTS WORLD IS OPEN CAN THESE FIGURES BE REVIEWED AGAINST CURRENT VALUES.

BIRMINGHAM INTERNATIONAL AIRPORT
- GROWTH (11.5m PASSENGERS/YEAR IN 2010 TO 27.2m PASSENGERS/YEAR IN 2030 - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).
- 19,340 NEW JOBS BY 2021 - SOURCE LONDON TO SCOTLAND WEST ROUTE STRATEGY EVIDENCE REPORT - APRIL 2014.
- 20,000 NEW JOBS PLUS OPPORTUNITY FOR A FURTHER 2770 JOBS SUBJECT TO CAPITAL INVESTMENT PROGRAMMES, AS WELL AS FURTHER JOB CREATION IF NEW AND EXISTING AIRLINES ARE ENGAGED TO INCLUDE FURTHER ROUTES - SOURCE SMBC M42 ECONOMIC GATEWAY MASTERPLAN REPORT (JUNE 2013).

HS2
- 47,000m^2 OF OFFICE SPACE (3,300 JOBS), 600 HOTEL BEDS (300 JOBS) 1,000m^2 OF RETAIL (50 JOBS) AND 10,000m^2 OF LEISURE SPACE (EQUIVALENT TO 150 JOBS). THIS EQUATES TO AN OVERALL NET IMPACT OF 3,800 ADDITIONAL JOBS - SOURCE SMBC M42 ECONOMIC GATEWAY MASTERPLAN REPORT (JUNE 2013).

UK CENTRAL (UKC)
- 60,000 NEW JOBS BY 2035 - SOURCE LONDON TO SCOTLAND WEST ROUTE STRATEGY EVIDENCE REPORT (APRIL 2014).

JAGUAR LAND ROVER (JLR)
- LODE LANE PLANT CURRENTLY PROVIDES 5,000 JOBS EXPECTED TO INCREASE WORKFORCE BY 25% - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).

SOLIHULL TOWN CENTRE
- ABOUT 34,000m^2 OF ADDITIONAL COMPARISON RETAIL FLOORSPACE BY 2021; A FURTHER 23,000m^2 DURING 2021 TO 2026; AND AN ADDITIONAL 2,800m^2 OF CONVENIENCE RETAIL FLOORSPACE TO 2026, AS WELL AS UP TO 35,000m^2 OF NEW OFFICE FLOORSPACE.
- NOTE - SHIRLEY TOWN CENTRE AND CHELMSLEY WOOD TOWN CENTRE ARE ALSO PLANNED FOR DEVELOPMENT - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).

BLYTHE VALLEY BUSINESS PARK
- CIRCA 600 HOMES TO BE CONSTRUCTED AND 1.75 MILLION SQ.FT. OF DEVELOPMENT WITHIN THE BUSINESS PARK - SOURCE SOLIHULL LOCAL PLAN (DEC 2013).

HOUSING SITES - SOURCE SOLIHULL LOCAL PLAN (DECEMBER 2013)
- 24 HOUSING SITES HAVE BEEN IDENTIFIED WITHIN THE SMB BOUNDARY, THIS EQUATES TO APPROXIMATELY 3960 NEW HOMES.

BUSINESS SITES - SOURCE SOLIHULL LOCAL PLAN (DECEMBER 2013)
- 41.5 HA. OF ALLOCATED BUSINESS SITES OF WHICH 27.5 HA. IS READILY AVAILABLE.
- LIST OF SITES:
  - TRW STRATFORD ROAD, SHIRLEY
  - SOLIHULL BUSINESS PARK, HIGHLANDS ROAD, MONKSPATH
  - FORE, STRATFORD ROAD, ADJ TO M42
  - CHEP/HIGGINSON, BICKENHILL LANE, BICKENHILL
  - LAND NORTH OF CLOCK INTERCHANGE COVENTRY ROAD
  - LAND ADJACENT TO THE BIRMINGHAM BUSINESS PARK (AS NOTED ON THE PLAN)

OTHER HEADLINE FIGURES
- LONDON TO SCOTLAND WEST ROUTE STRATEGY EVIDENCE REPORT (APRIL 2014)
- FUTURE CONSIDERATIONS OF 55000 NEW HOMES AND 155000 NEW JOBS IN THE GREATER BIRMINGHAM AND SOLIHULL AREA.
- BIRMINGHAM CITY ENTERPRISE ZONE (BIRMINGHAM BOX) - 40000 JOBS BY 2031.
- SMBC M42 ECONOMIC GATEWAY MASTERPLAN REPORT (JUNE 2013)
  - SOME 80% OF ALL OF THE NEW JOBS ASSOCIATED WITH THE MASTERPLAN ARE EXPECTED TO BE CREATED AT THE HUB AND THIS WILL HAVE A SIGNIFICANT EFFECT ON THE HIGHWAY NETWORK, PARTICULARLY AT M42 JUNCTION 6. THIS JUNCTION CURRENTLY CARRIES SOME 5,900 VEHICLES PER HOUR IN PEAK PERIODS AND OF THESE:
    - 15%-20% OF TRIPS ARE ASSOCIATED WITH BIRMINGHAM AIRPORT;
    - 10%-15% OF TRIPS ARE ASSOCIATED WITH THE NEC;
    - 30% OF TRIPS ARE MOVING BETWEEN THE M42 AND A45 COVENTRY ROAD TOWARD BIRMINGHAM; AND 35% OF TRIPS ARE MOVING BETWEEN M42 AND A45 COVENTRY ROAD TOWARDS COVENTRY.

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. STATUTORY UNDERTAKERS APPARATUS SHOWN ARE INDICATIVE AND BASED ON INFORMATION RECEIVED FOLLOWING C2 ENQUIRIES.
3. UKC STRUCTURE LOCATIONS BASED ON INFORMATION RECEIVED FROM HIGHWAYS ENGLAND.
4. HS2 ALIGNMENT BASED ON AN XREF RECEIVED FROM ARUP.
5. HS2 PEOPLE MOVER BASED ON INTERPRETATION OF THE HYBRID BILL DRAWINGS.
6. STRATEGIC WASTE MANAGEMENT SITE LOCATIONS ARE BASED ON SOLIHULL LOCAL PLAN PROPOSALS MAP CREATED NOVEMBER 2013.
7. STAKEHOLDER BOUNDARIES SHOWN ARE INDICATIVE AND NOT ALL ARE SHOWN FOR CLARITY.
8. FOR A DETAILED ENVIRONMENTAL CONSTRAINTS PLAN REFER TO DRAWING HE551485-MOU-3000-M42 J6-DR-EN-001 TO 002.
9. FOR A DETAILED GEOTECHNICAL HAZARDS PLAN REFER TO DRAWING HE551485-MOU-0600-M42 J6-SK-GE-001.

KEY

- HIGHWAYS ENGLAND NETWORK
- LOCAL ROADS
- STAKEHOLDERS - COMMUNITIES & BUSINESSES
- HS2 RAIL ALIGNMENT (INDICATIVE)
- HS2 ROAD ALIGNMENT (INDICATIVE)
- HS2 PEOPLE MOVER (INDICATIVE)
- BIRMINGHAM - EUSTON LINE
- RIVER/STREAM/BROOK
- PROPOSED UKC STRUCTURES
- SSSI
- ANCIENT WOODLAND/COPPICE/COPSE
- STRATEGIC WASTE MANAGEMENT SITE
- GREEN BELT
- FLOOD ZONE

Iss:	Amendment	By	Chkd	Appd	Date
0.5	UPDATED RAILWAY TEXT & M6 LINETYPE	JC	GM	OG	MAY 16
0.4	OS MAP REMOVED & GREEN BELT/NOTES UPDATED	IS	GM	OG	APR 16
0.3	REF NO REV, GREEN BELT & FLOOD ZONES ADDED	DM	OG	RJ	09/12/15
0.2	SCALE, CONTENT AND DISPLAY AMENDED	DM	OG	RJ	13/11/15

Client: Working on behalf of highways england

Issued only for purpose Indicated: INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: STAKEHOLDER PLAN
KEY AREAS/DEVELOPMENTS

Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date	Checked	Date	Approved	Date
DM	NOV 15	DM	NOV 15	OG	NOV 15	OG	NOV 15

Scale: 1:20000
Project Ref No.: 1071038
Original Size: A1
Revision/ Issue Number: 0.5

Drawing Number: HE551485 – MOU – GEN – M42 J6 – SK – D – 0100
(HE PIN | Originator | Volume | Location | Type | Role | Number)

mouchel
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NOTES

1. STATUTORY UNDERTAKERS APPARATUS SHOWN ARE INDICATIVE AND BASED ON INFORMATION RECEIVED FOLLOWING C2 REQUESTS.
2. FOR ENVIRONMENTAL CONSTRAINT PLAN REFER TO DRAWING HE551485-MOU-GEN-M42 J6-DR-EN-0001 TO 0002.
3. FOR GEOHAZARD PLAN REFER TO DRAWING HE551485-MOU-HGT-M42 J6-DR-GE-0001.

KEY

- ESSO PETROLEUM MAIN
- BT(UG) — BT OPENREACH (UNDERGROUND)
- BT(OH) — BT OPENREACH (OVERHEAD)
- 132kV — WESTERN POWER DISTRIBUTION (132kV)
- 33kV — WESTERN POWER DISTRIBUTION (33kV)
- 11kV — WESTERN POWER DISTRIBUTION (11kV)
- LV(OH) — WESTERN POWER DISTRIBUTION (LV) OH
- LV(UG) — WESTERN POWER DISTRIBUTION (LV) UG
- G — GENESYS
- GAS(LHP) — NATIONAL GRID GAS (LHP)
- GAS(LP) — NATIONAL GRID GAS (LP)
- GAS(MP) — NATIONAL GRID GAS (MP)
- 400kV — NATIONAL GRID POWER (OH) 400kV
- ZAYO — ZAYO GROUP
- VM — VIRGIN
- VODA — VODAFONE
- WATER — SEVERN TRENT WATER PIPE
- FS — SEVERN TRENT FOUL SEWER
- FS(P) — SEVERN TRENT PRESSURISED FOUL SEWER
- Xs — SEVERN TRENT ABANDONED SEWER
- X — SEVERN TRENT ABANDONED PIPE
- AQUEDUCT — AQUEDUCT
- WESTERN POWER DISTRIBUTION TBC
- WESTERN POWER DISTRIBUTION TBC
- WESTERN POWER DISTRIBUTION PYLON
- NATIONAL GRID PYLON

SCALE 1:2500

Iss:	Amendment	By	Chkd	Appd	Date
0.2	General updates to plan & Inset added	IS	GM	GM	MAY 16

Client: Working on behalf of highways england

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INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: EXISTING STATUTORY UNDERTAKER'S APPARATUS PLAN

Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date	Checked	Date	Approved	Date
DM	JAN 16	DM	JAN 16	GMN	JAN 16	OG	JAN 16

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.2

Drawing Number: HE551485 – MOU – VUT – M42 J6 – SK – D – 0001
(HE PIN | Originator | Volume | Location | Type | Role | Number)

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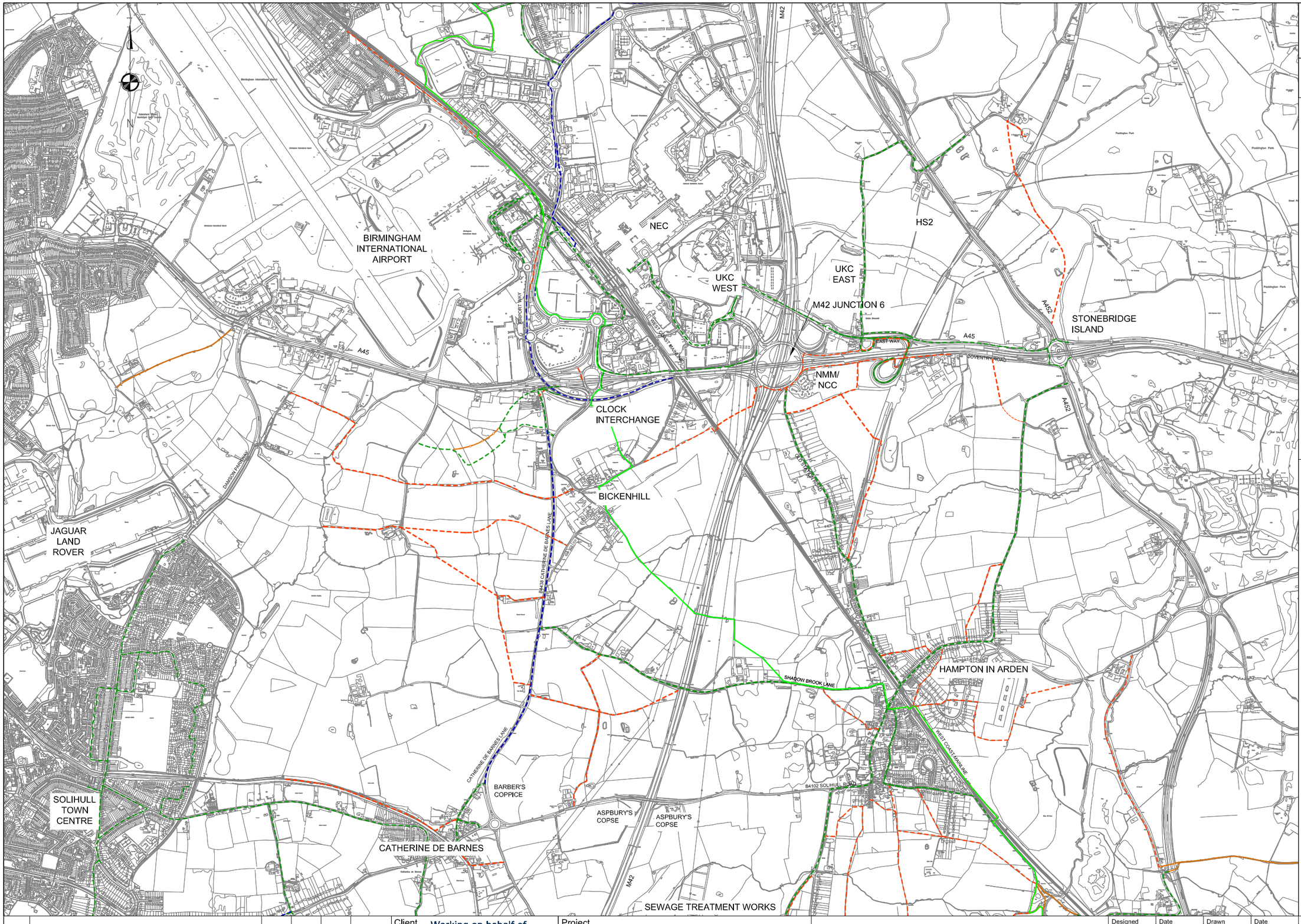

NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. PUBLIC RIGHTS OF WAY SHOWN ARE BASED ON ORDNANCE SURVEY MAPPING AND SOLIHULL CYCLING AND WALKING MAP (2014).

KEY

- EXISTING FOOTPATHS
- EXISTING ADVISORY CYCLE ROUTES
- EXISTING SHARED FOOTPATH/CYCLEWAY
- EXISTING BRIDLEWAY
- GREEN MAN TRAIL

Iss:	Amendment	By	Chkd	Appd	Date

Client: Working on behalf of highways england

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INFORMATION

Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: NON-MOTORISED USERS PLAN
PCF STAGE 1
OPTIONEERING

Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date
DM	JAN 16	DM	JAN 16

Checked	Date	Approved	Date
OG	JAN 16	RJ	JAN 16

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.1

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Drawing Number

HE PIN	Originator	Volume	Location
HE551485	MOU	ENM	M42 J6
	SK	D	0001
	Type	Role	Number

NOTES

1. INFORMATION SHOWING THE LOCATION OF THE FEATURES IN GREATER DETAIL AND FURTHER INFORMATION ON THE FEATURES CAN BE FOUND IN THE ARUP 2002 PSSR (HA GDMS NO.18059)
2. GEOHAZRAD FOOTPRINT TO BE EXTENDED AS REQUIRED.

KEY

GEOLOGY

- FLUVIOGLACIAL SAND AND GRAVEL
- MADE GROUND
- ALLUVIUM
- RIVER TERRACE
- DIP-SLIP FAULT (DISPLACEMENT UNKNOWN)

HE EARTHWORKS

- EW-32 EARTHWORK REFERENCE: REFER TO SUMMARY TABLE FOR DETAILS
- EARTHWORK (CUTTING)
- EARTHWORK (EMBANKMENT)
- DEFECT IN EARTHWORK

HAZARDS

- LANDFILL
- SHADOW BROOK
- OTHER HAZARD
- 65 HAZARD REFERENCE: REFER TO SUMMARY TABLE FOR DETAILS

TRANSPORT INFRASTRUCTURE

- HS2 ALIGNMENT
- EXISTING HIGHWAY TO BE IMPROVED
- SIDE ROAD, LOCAL ROAD
- PROPOSED LINKS/ROAD
- PROPOSED STRUCTURE
- INDICATIVE EMBANKMENTS

Iss:	Amendment	By	Chkd	Appd	Date
0.2	Revised scale, general drawing update.	BAA	MH	BS	05/16

Client: Working on behalf of highways england

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Project: REGIONAL INVESTMENT PROGRAMME
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title: GEOHAZARD PLAN

Overall Scheme Plan (NTS)

Designed	Date	Drawn	Date
JH	AUG 15	JH	AUG 15

Checked	Date	Approved	Date
MH	AUG 15	BS	AUG 15

Scale	Project Ref No.
1:10000	1071038
Original Size	**Revision/ Issue Number**
A1	0.2

Drawing Number: HE PIN | Originator | Volume | Location
HE551485 – MOU – HGT – M42 J6
– DR – GE – 0001
Type | Role | Number

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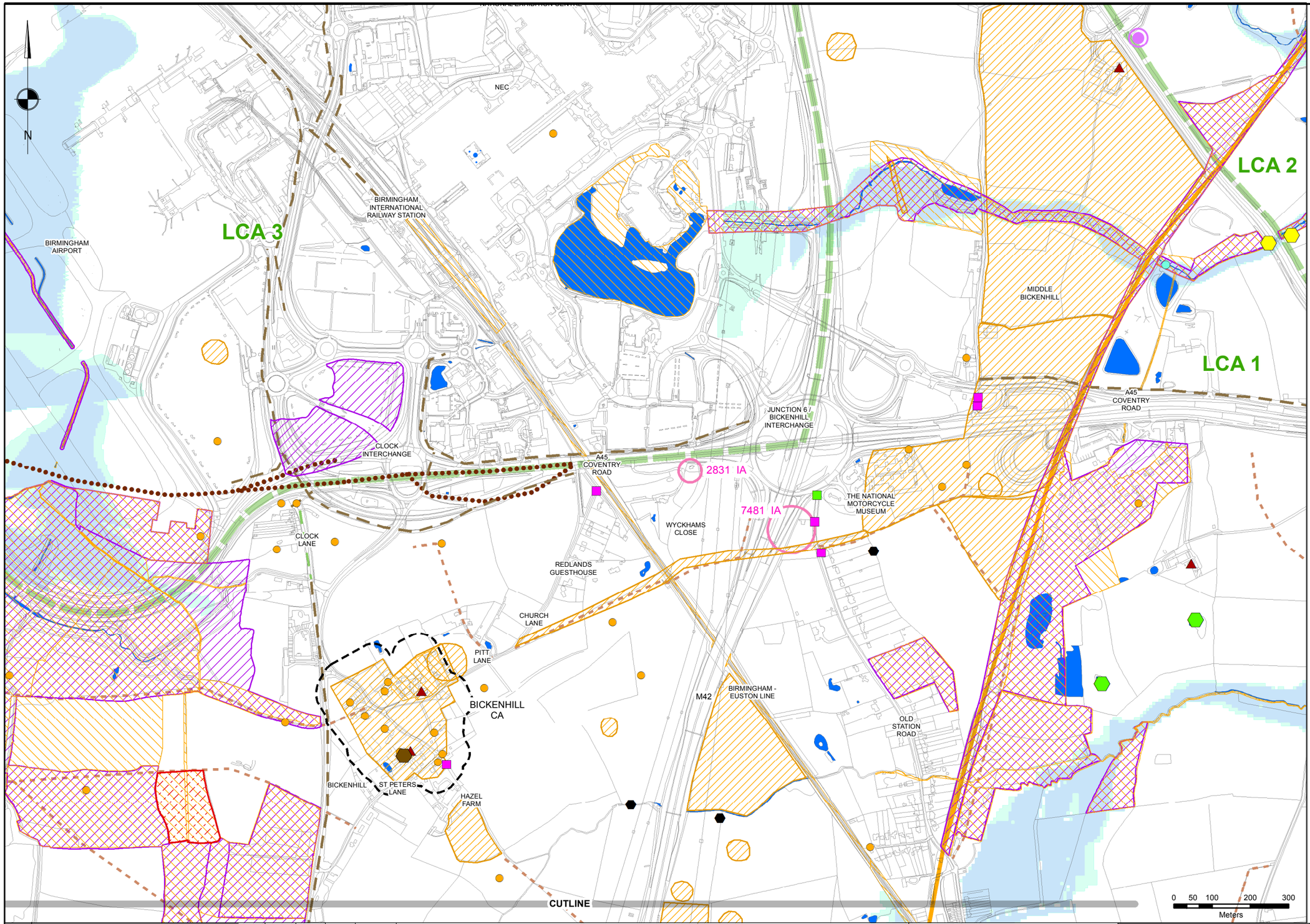

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KEY

AIR QUALITY
- POLLUTION CLIMATE MAPPING (PCM) LINK
- HIGHWAYS ENGLAND AIR QUALITY MONITORING SITE
- LOCAL AUTHORITY AIR QUALITY MONITORING SITE

CULTURAL HERITAGE
- LISTED BUILDING
- HERITAGE ASSET
- SCHEDULED MONUMENT
- CONSERVATION AREA (CA)
- REGISTERED PARKS AND GARDENS

LANDSCAPE
- LANDSCAPE CHARACTER AREA - LCA

NOISE
- DEFRA NOISE IMPORTANT AREA (IA)

ROAD DRAINAGE & WATER ENVIRONMENT
- MAIN RIVER
- RIVER & OPEN WATER
- FLOOD ZONE 3
- FLOOD ZONE 2

POLLUTION INCIDENT
- MAJOR
- SIGNIFICANT

WATER ABSTRACTION LICENCE -
- GROUNDWATER SOURCES: SMALL
- SURFACEWATER SOURCES: MEDIUM, SMALL

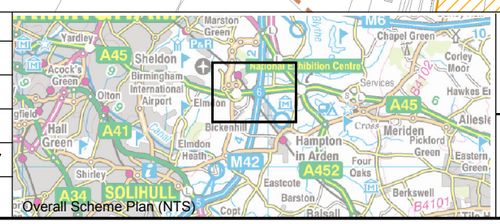
PEOPLE AND COMMUNITIES

PUBLIC RIGHTS OF WAY
- FOOTPATH
- CYCLEWAY OFF ROAD
- NATIONAL CYCLE NETWORK
- CYCLEWAY ON ROAD
- RECREATIONAL FACILITY

NATURE CONSERVATION
- LOCAL WILDLIFE SITE (LWS)
- ECOSITE (ES)
- ANCIENT WOODLAND (AW)
- SITES OF SPECIAL SCIENTIFIC INTEREST (SSSI)

SPECIES
- BAT ROOSTS
- COMMON TOADS
- GREAT CREASTED NEWT
- OTTER SPRAINTS
- SMALL HEATH
- LATTICED HEATH
- BLACK POPULAR

Iss:	Amendment	By	Chkd.	Appd.	Date
P01	FIRST ISSUE	DAW	AS	NV	MAY 2017



Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title
ENVIRONMENTAL CONSTRAINTS
SHEET 1 OF 2

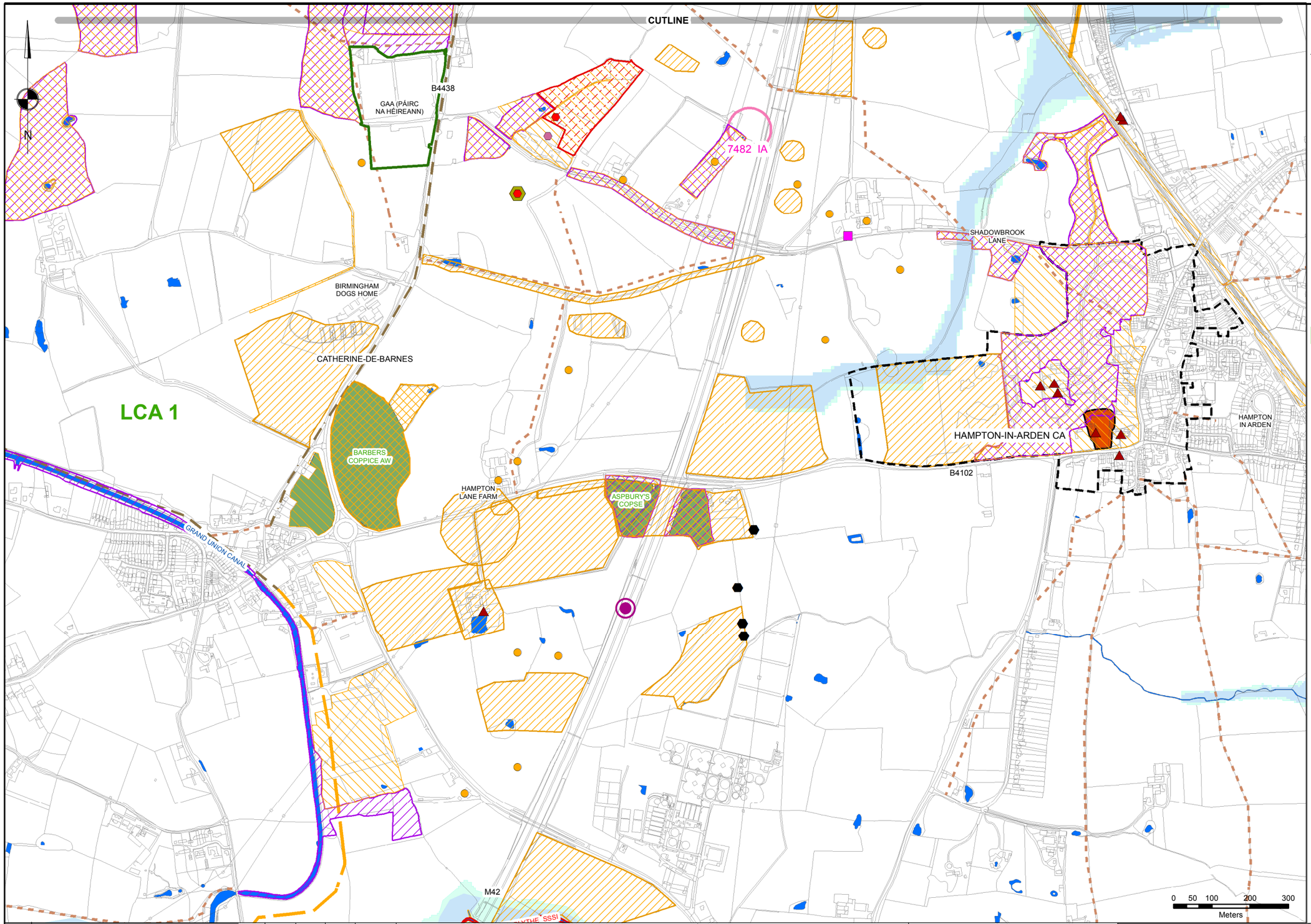
Office
mouchel
building great relationships
EXPORT HOUSE
CAWSEY WAY, WOKING,
SURREY, GU21 6QX
TEL: 01483 731391

Client
Working on behalf of
highways england

Scale	Drawn	Checked	Approved	Authorised
1:10,000	DAW	MD	MD	NV
Original Size	Date	Date	Date	Date
A3	MAY 17	MAY 17	MAY 17	MAY 17

Status: SUITABLE FOR INFORMATION

Drawing No. Project	Originator	Volume	Suitability
HE551485	MOU	EGN	S2
M42_J6	DR	LE	0025
Location	Type	Role	Number	Revision: P01



KEY

AIR QUALITY
- POLLUTION CLIMATE MAPPING (PCM) LINK
- HIGHWAYS ENGLAND AIR QUALITY MONITORING SITE
- LOCAL AUTHORITY AIR QUALITY MONITORING SITE

CULTURAL HERITAGE
- LISTED BUILDING
- HERITAGE ASSET
- SCHEDULED MONUMENT
- CONSERVATION AREA (CA)
- REGISTERED PARKS AND GARDENS

LANDSCAPE
- LANDSCAPE CHARACTER AREA - LCA

NOISE
- DEFRA NOISE IMPORTANT AREA (IA)

ROAD DRAINAGE & WATER ENVIRONMENT
- MAIN RIVER
- RIVER & OPEN WATER
- FLOOD ZONE 3
- FLOOD ZONE 2

POLLUTION INCIDENT
- MAJOR
- SIGNIFICANT

WATER ABSTRACTION LICENCE -
- GROUNDWATER SOURCES: SMALL
- SURFACEWATER SOURCES: MEDIUM, SMALL

PEOPLE AND COMMUNITIES

PUBLIC RIGHTS OF WAY
- FOOTPATH
- CYCLEWAY OFF ROAD
- NATIONAL CYCLE NETWORK
- CYCLEWAY ON ROAD
- RECREATIONAL FACILITY

NATURE CONSERVATION
- LOCAL WILDLIFE SITE (LWS)
- ECOSITE (ES)
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- SITES OF SPECIAL SCIENTIFIC INTEREST (SSSI)

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- BAT ROOSTS
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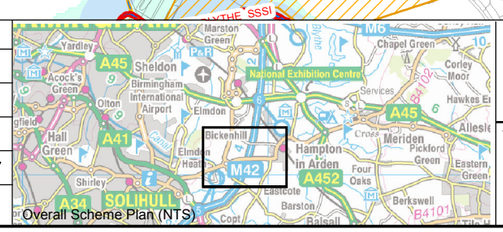
Iss:	Amendment	By	Chkd.	Appd.	Date
P01	FIRST ISSUE	DAW	AS	NV	MAY 2017



Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Title
ENVIRONMENTAL CONSTRAINTS
SHEET 2 OF 2

Office
mouchel
building great relationships
EXPORT HOUSE
CAWSEY WAY, WOKING,
SURREY, GU21 6QX
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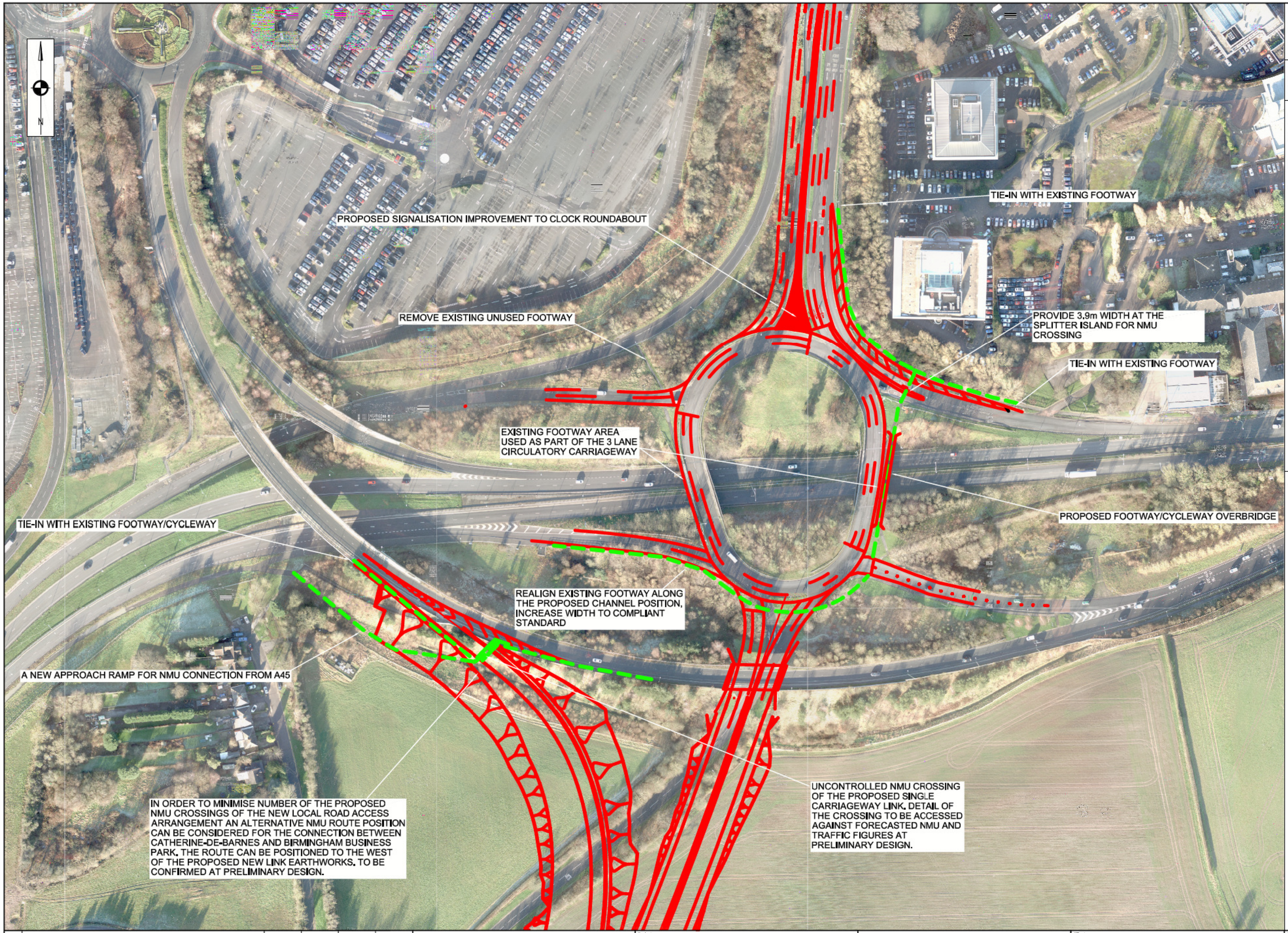
Client
Working on behalf of
highways england

Scale	Drawn	Checked	Approved	Authorised
1:10,000	DAW	MD	MD	NV
Original Size	Date	Date	Date	Date
A3	MAY 17	MAY 17	MAY 17	MAY 17

Status: SUITABLE FOR INFORMATION

Drawing No. Project	Originator	Volume	Suitability
HE551485	MOU	EGN	S2
M42_J6	DR	LE	0026
Location	Type	Role	Number	Revision: P01



NOTES

1. NMU PROPOSAL IS SUBJECT TO THE NMU AUDIT PROCESS.
2. PROPOSALS ARE OUTLINE DESIGNS DISCUSSED WITH SOLIHULL METROPOLITAN BOROUGH COUNCIL - THE LOCAL AUTHORITY IN THIS AREA.
3. THE USE OF 'INFORMAL' CROSSING HAS NOT BEEN ASSESSED AGAINST THE OPENING OR DESIGN YEAR TRAFFIC FLOWS.
4. PROPOSALS WILL NEED TO BE ASSESSED AGAINST DDA REGULATIONS.

KEY

NMU REALIGNMENT AT CLOCK JUNCTION

NEW ROAD ALIGNMENT

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P02	AMENDMENTS FOLLOWING COMMENTS	TO	DM	GM	MAY 17

Project

WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title

PROPOSED NMU REALIGNMENT AT CLOCK JUNCTION

Office

mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE, SUTTON COLDFIELD, B72 1PH
Tel: 0121 355 8649
Fax: 0121 355 8901
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Client

Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
1:1000	TO	OM	GM	RJ
Original Size: A1	Date: MAY 17	Date: MAY 17	Date: MAY 17	Date: MAY 17

Status: SUITABLE FOR INFORMATION

Drawing No				Suitability
Project: HE551485 -	Originator: MOU -	Volume: GEN		S2
Location: M42_J6 -	Type: SK -	Role: CH -	Number: 0118	Revision: P02

plot date: 06/07/2017 16:49:13 by: Jamie Cl[illegible]

Appendix E – Assessments

Date: 3/5/2017

Options considered		Score
Option 1 - West of Bickenhill, from Clock Interchange to potential MSA junction - As Public Consultation	Good	3
Option 1B - Modified to reduce impact to the Gaelic Football Club (East Option)	OK	2
Option 2 - East of Bickenhill, from Clock Interchangeto potential MSA junction - As Public Consultation	Poor	1
Option 3 - East of Bickenhill, Free flow south facing slips onto M42 south of Jn 6 - As Public Consultation		

Criteria	Evidence Source	Specific Evidence	Options				Comments
			1	1B	2	3	
DFT RIS Brief	Comprehensive Upgrade of the Junction						All consultation options remove significant traffic from exsiting circulatory and free flow links on north east/west corners and upgrades to signs/lines constitute a comprehensve improvement
	Allow better movement on and off A45						Free flow link at SE Corner (NMM) not included in Options 1 and 2
	Supporting access to Birmingham Airport						Option 1 and associated variants provide better access to BA compared to the other options. This is because the alignment connects to Airport Way without the need for an additional roundabout north of Bickenhill.
	Preparing Capacity for HS2						
			10	10	10	10	
HE Imperatives	Safety - EAR/ TAR	KSI saving/ construction/ Maintenance ease.					Horizontal geometry relaxations are present in all options, however, Option 1 provides a 900m radius compared to a 720m in 1 A and 1B. All Option 1 designs including variants have compliant vertical geometry. Option 1A loop connection to dual link has a tighter geometry compared with Option 1 and 1B. Numerous DfS on northern junction, Options 2 and 3 roundaout on high speed link
	Customer Satisfaction - EAR	JTR/ Time savings/ NMU issues					use of network in a safe and reliable way, minimum disruption construction and maintenance, prevent delays at junction
	Deliverability Programme , Buildabillity, Planning (DCO)	Can the scheme be delivered/ could we Build it?					Option 3 carry high programming risk due to the National Grid 400kV outage and Political Interest. Works at J6 are coincident with all options, however, if works at J6 were to be de-scoped the argument to provide a scheme with more resilience should take precedence, i.e. an all movement junction to the South
			8	8	7	5	
Economics	Affordable Commercial Estimate	Commercial Estimate	295m		285m	270m	Free flow link at SE corner (NMM) removed from estimate for Opts 1 and 2
	BCR EcAR (BCR >1.5)	BCR (core model)					Option 1 (inc variants) BCR between 1.5 and 2 based on costs above. Option 1 assumed improvements to clock required (extra lanes on circulatory) and improvements to NEC network assumed to remove congestion, also inludes the free flow link at NMM (SE Corner). Option 3, very similar to Option 2, not attracting traffic in current form, could be due to additional rounabout south of clock interchange. Significant reduction in benefits compared to option 1.
	Encourages future economic development TAR/ VfM statement	UGC/ Airport/ JLR etc.					Main stakeholder in the area are supportive of Option 1.
			7	8	6	6	
Public Consultation	Supported by Locals Consultation Report	%age local resident support	60%		2%	36%	Percentages shown are for the options shown at consultation not the revised options and for those within the consultation boundary. The Northern option was not an option at consultation but in the freetext. 9 respondents queried why it was discounts (1xMP, 1x CPRE, 1x residents association, 1xRamblers Association, 5x individual residents)
	Supported by Businesses Consultation Report	% age business support	82%		0%	6%	Percentages shown are for the options shown at consultation not the revised options. There was also a "no preference"option not presented. The Northern option was not an option at consultation but in the freetext. 9 respondents queried why it was discounts (1xMP, 1x CPRE, 1x residents association, 1xRamblers Association, 5x individual residents)
	Supported by SMBC/ Parish Councils Letters/ Responses	Yes/ NO	Yes		No	No	Responses to public consulation received from SMBC and Hampton in Arden Parish Council. The Parish Council stressed that their preference was the 'least worst' option. The Northern option was not an option at consultation but in the freetext. 9 respondents queried why it was discounts (1xMP, 1x CPRE, 1x residents association, 1xRamblers Association, 5x individual residents)
			9	9	3	5	
Environmental Effects	Least Effect on Green Belt EAR/EIA/ Greenbelt Policy doc	Policy Document/					All options would require a compelling need argument, to demonstrate the need to use greenbelt land., scored on impact of openness in green belt.
	Effect on land	Ha taken	35.4ha	37.3ha	32ha	17ha	These areas are earthworks extent and some redundant land, for Option 1A and 1B which includes the triangular area of land adjacent to the local road connection near to the dogs home.
	Effect on Landscape Character EAR/EIR/TAR	Env Report/ TAR/ subjective view					Green Belt will require evidence of special circumstance will ne to be a clear and robust evidence that there are no alternatives outside the Green Belt that meet the needs of the M42
	Direct Impact on residential properties EAR/ Landtake Plans/ TAR	No of properties taken/ significantly effected	0	1	3	3	Option 1A property (Four Winds) suggested at public consultation event that they would sell - this needs to be followed up by Highways England, to receive a written response, Option 1B (Heath End house) is currently for sale.Need to demonstrate impacts can be mitigated
	Effect on businesses (Inc GAA)	No of businesses effected/ business opportunities/ opportunities lost	1	1	2	1	Option 1 affects all GAA pitches, but consideration will be given to mitigation, Option 1B affects 1 pitch only. Options 2 and 3 effect local farm and riding stables.
	- Noise EAR/ AST	number of special areas within 50m (schools churches/ hospitals etc…)					Scoring based on number of properies affected not indivudual noise effects
	- AQ EAR/ AST				16		Scoring based on number of properies affected not indivudual AQ effects
	- Nature Conservation and Biodiversity (SSSI) EAR/AST/TAR						Following meeting with planners, impact to the SSSI is a **major** concern for DCO process.
	Cultural Heritage EAR/AST/TAR						Some listed buildings in Bickenhill, until carry out archaeological investigations don't know impact on heritage
	Built Environment EAR						
	Water Environment EAR/AST						
	Visual Impact EAR						Bickenhill Village - Option 1A is further away.
	People and Communities EAR						Impact to Option 1 is direct impact to GAA and their community, options 2 and 3 cur Bickenhill in half. impact to GAA reducesd by option 1B
			22	23	19	22	

HE KPI's	Encouraging Economic Growth EAR/TAR	Time savings/ Future Resilience/ Encourages Growth					Option 1 preferred by local authority and incorporated into draft local plan, also supports HS2 , Birmingham Airport and NEC.
	Making the network safer EcAR/TAR	KSI's/ potential accident savings by removal of issues.					Minor improvements to safety, however concerns with the Geometry of Options 2 and 3, with a high speed road coming up to a traffic light controlled roundabout - with limited SSD.
	Keeping the network in good condition CSR	length of road replaced					Beneficial, as reducing the amount of trafficv currently using the junction.
	Improving user satisfaction TAR	JTR/ Resilience of the Network/ ability to stop -rest					All options improve JTR. Options 1 and 2 could incl an MSA, which would reduce stress levels as enable people to stop and wait befoe going to the Airport etc.
	Delivering better env outcomes TAR	AST's/ TAR/ EIA					
	NMU's TAR/AST	footpaths/ potential NMU mitigation / improvements?					Opt 1 provides the biggest potential to improve the NMU network in the area.
			16	16	13	12	
General	SU issues? C3 Estimates	Number/ Type/ Complexity of SU diversions required - effect on programme					Option 3 costs approx. £27m, Option 2 costs approx. £12m, Option 1 costs approx. £12m.
	Stakeholder problems Public Consultation	Effect on stakeholders					some support form villagers for Option 3, but commercial stakeholders , SMBC and MP prefer Option 1; major political fallout idf a nother option chosen.
	Departures from Standards DfS Checklist	No / type/ complexity and potential for being granted.					Option 1 and the variants, the new southern junction and connection into Clock Interchange are same within each option. A DfS required is for sub-standard weaving length for the local road connectivity, however, this is only a minor shortfall in weaving, with the potential to be designed out subject to the local slip road layouts/designs. Option 2 and 3 departures are constrained as a result of the existing Airport Way flyover, more work is required to improve to support justification of these departures.
	Buildabillity Issues Buildability Contractors advice	Online/ Offline - Quadro ? Safety aspects of construction?					Opportunity for MSA to construct southern Junction. Option 1B includes a high skew(60 deg) structure in a greenfield site. Optio 3 has a large high skew structure over the M42. Options 2 and 3 would require a number of 132kv pilons to be moved. Contractor thisks this is mainly std works.
	Routine Maintenance Maintenance regime, TM required, Impact of same, duration of each option? Fetures to minimise H&S during maintenance	Maintenance and Repair Strategy statement (MRSS)					Options 1 and 2 through green field sites, able to take land to ensure appropriate maintenance can be carried out. Major maintenance ocnsidered only.
			15	14	10	8	
Score TOTAL			**87**	**88**	**68**	**68**	

Options considered

Option 1 - As Public Consultation
Option 1A - Modified to reduce impact to the Gaelic Football Club (West Option)
Option 1B - Modified to reduce impact to the Gaelic Football Club (East Option)
Option 1C - Modified to reduce impact to the Gaelic Football Club (Nursery Option)

	Score
Good	3
OK	2
Poor	1

Criteria		Specific Evidence	Options				Comments
			1	1A	1B	1C	
DFT RIS Brief	Comprehensive Upgrade of the Junction						All consultation options remove significant traffic from exsiting circulatory and free flow links on north east/west corners and upgrades to signs/lines constitute a comprehensve improvement
	Allow better movement on and off A45						Free flow link at SE Corner (NMM) not included in Options 1 and 2
	Supporting access to Birmingham Airport						Option 1 and associated variants provide better access to BA compared to the other options. This is because the alignment connects to Airport Way without the need for an additional roundabout north of Bickenhill.
	Preparing Capacity for HS2						
			10	10	10	10	
HE Imperatives	Safety	KSI saving/ construction/ Maintenance ease.					Horizontal geometry relaxations are present in all options, however, Option 1 provides a 900m radius compared to a 720m in 1 A and 1B. All Option 1 designs including variants have compliant vertical geometry. Option 1A loop connection to dual link has a tighter geometry compared with Option 1 and 1B. Numerous DfS on northern junction, Options 2 and 3 roundaout on high speed link
	Customer Satisfaction	JTR/ Time savings/ NMU issues					use of network in a safe and reliable way, minimum disruption construction and maintenance, prevent delays at junction
	Deliverability	Can the scheme be delivered/ could we Build it?					Option 1B bridge skew is more challenging compared to Option 1 and 1A, however, improvements could be made at preliminary design. Option 3 and potentially Works at J6 are coincident with all options, however, if works at J6 were to be de-scoped the argument to provide a scheme with more resilience should take precedence, i.e. an all movement junction to the South
			8	8	8	8	
Economics	Affordable	Commercial Estimate	295m				Free flow link at SE corner (NMM) removed from estimate for Opts 1 and 2
	BCR	BCR (core model)					Option 1 (inc variants) BCR between 1.5 and 2 based on costs above. Option 1 assumed improvements to clock required (extra lanes on circulatory) and improvements to NEC network assumed to remove congestion, also inludes the free flow link at NMM (SE Corner). Option 3, very similar to Option 2, not attracting traffic in current form, could be due to additional rounabout south of clock interchange. Significant reduction in benefits compared to option 1.
	Encourages future economic development	UGC/ Airport/ JLR etc.					Main stakeholder in the area are supportive of Option 1.
			7	8	8	8	
Public Consultation	Supported by Locals	%age local resident support	60%				Percentages shown are for the options shown at consultation not the revised options and for those within the consultation boundary. The Northern option was not an option at consultation but in the freetext. 9 respondents queried why it was discounts (1xMP, 1x CPRE, 1x residents association, 1xRamblers Association, 5x individual residents)
	Supported by Businesses	% age business support	82%				Percentages shown are for the options shown at consultation not the revised options. There was also a "no preference"option not presented. The Northern option was not an option at consultation but in the freetext. 9 respondents queried why it was discounts (1xMP, 1x CPRE, 1x residents association, 1xRamblers Association, 5x individual residents)
	Supported by SMBC/ Parish Councils	Yes/ NO	Yes				Responses to public consulation received from SMBC and Hampton in Arden Parish Council. The Parish Council stressed that their preference was the 'least worst' option. The Northern option was not an option at consultation but in the freetext. 9 respondents queried why it was discounts (1xMP, 1x CPRE, 1x residents association, 1xRamblers Association, 5x individual residents)
			9	9	9	9	
Environmental Effects	Least Effect on Green Belt	Policy Document/					All options are inappropriate developments in green belt, scored on impact of openness in green belt.
	Effect on land	Ha taken	35.4ha	34.4ha	37.3ha	41.2ha	These areas are earthworks extent and some redundant land, for Option 1A and 1B which includes the triangular area of land adjacent to the local road connection near to the dogs home.
	Effect on Landscape Character	Env Report/ TAR/ subjective view					Green Belt will require evidence of special circumstance will ne to be a clear and robust evidence that there are no alternatives outside the Green Belt that meet the needs of the M42
	Direct Impact on residential properties	No of properties taken/ significantly effected	0	1	1	3	Option 1A property (Four Winds) suggested at public consultation event that they would sell - this needs to be followed up by Highways England, to receive a written response, Option 1B (Heath End house) is currently for sale.Need to demonstrate impacts can be mitigated
	Effect on businesses (Inc GAA)	No of businesses effected/ business opportunities/ opportunities lost	1	0	1	1	Option 1 affects all GAA pitches, but consideration will be given to mitigation, Option 1B affects 1 pitch only
	- Noise	number of special areas within 50m (schools churches/ hospitals etc…)					Scoring based on number of properies affected not indivudual noise effects
	- AQ						Scoring based on number of properies affected not indivudual AQ effects
	- Nature Conservation and Biodiversity (SSSI)						Option 1A directly impacts on designated site (SSSI - Bickenhill Meadows). Following meeting with planners, impact to the SSSI is a major concern for DCO process.
	Cultural Heritage						Some listed buildings in Bickenhill, until carry out archaeological investigations don't know impact on heritage
	Built Environment						
	Water Environment						
	Visual Impact						Bickenhill Village - Option 1A is further away.
	People and Communities						Impact to Option 1 and 1B is direct impact to GAA, although impact to GAA in 1B is reduced (one pitch)
			22	23	23	21	
HE KPI's	Encouraging Economic Growth	Time savings/ Future Resilience/ Encourages Growth					Option 1 preferred by local authority and incorporated into draft local plan
	Making the network safer	KSI's/ potential accident savings by removal of issues.					Based on London tp Scotland West Route Straetgy Evidence Report (April 2014) the M42 at J6 is in the bottom 30% of Total Casualtities per billion vehicle miles (2009 to 2011)
	Keeping the network in good condition	length of road replaced					
	Improving user satisfaction	JTR/ Resilience of the Network/ ability to stop -rest					
	Delivering better env outcomes	AST's/ TAR/ EIA					
	NMU's	footpaths/ potential NMU mitigation / improvements?					
			16	15	16	16	

General	SU issues?	Number/ Type/ Complexity of SU diversions required - effect on programme					Option 3 costs approx. £27m, Option 2 costs approx. £12m, Option 1 costs approx. £12m. Option 1 costs do not include any costs for impact on fuel pipeline, it is likely Option 1A would increase due to the impact on a 132kv pylon and has potential extra cost being closer to the fuel pipeline. No variants have had C3 submitted.
	Stakeholder problems	Effect on stakeholders					some support form villagers for Option 3, but commercial stakeholders preferred Option 1
	Departures from Standards	No / type/ complexity and potential for being granted.					Option 1 and the variants, the new southern junction and connection into Clock Interchange are same within each option. The differences relate to the horizontal and vertical alignment of the dual link. A DfS required is for sub-standard weaving length for the local road connectivity, however, this is only a minor shortfall in weaving, with the potential to be designed out subject to the local slip road layouts/designs. Option 2 and 3 departures are constrained as a result of the existing Airport Way flyover, more work is required to improve to support justification of these departures.
	Buildabillity Issues	Online/ Offline - Quadro ? Safety aspects of construction?					Opportunity for MSA to construct southern Junction. Option 1B has potential for more buildability issues with a skewed (60deg) structure
	Routine Maintenance	Maintenance and Repair Strategy statement (MRSS)					Options 1 and 2 through green field sites, able to take land to ensure appropriate maintenance can be carried out. Major maintenance ocnsidered only. Potential for additional maintenance costs on bearing replacements for Option 1B.
			15	14	14	15	
Score TOTAL			**87**	**87**	**88**	**87**	

M42 JUNCTION 6 PHASE 2 OPTIONS COMPARISON

DESIGN FACTOR	OPTION 1	OPTION 1 A	OPTION 1 B	OPTION 1 C
LINK DESIGN SPEED / LENGTH	**120KPH/2.4KM**	**120KPH/2.7KM**	**120KPH/2.3KM**	**120KPH/2.3KM**
VERTICAL GEOMETRY (RELAXATIONS)	NO RELAXATIONS	NO RELAXATIONS	NO RELAXATIONS	NO RELAXATIONS
HORIZONTAL GEOMETRY (RELAXATIONS)	1 - 1 STEP	1 - 1 STEP	1 - 1 STEP	1 - 1 STEP
VISIBILITY (RELAXATIONS)	1 - 1 STEP	1 - 1 STEP	1 - 1 STEP	1 - 1 STEP
DEPARTURES	1 - MINOR SHORTFALL IN WEAVING LENGTH	1 - MINOR SHORTFALL IN WEAVING LENGTH	1 - MINOR SHORTFALL IN WEAVING LENGTH	1 - MINOR SHORTFALL IN WEAVING LENGTH
DIRECT IMPACT ON PRIVATE PROPERTIES	0	1	1	3
DIRECT IMPACT ON COMMERCIAL/RECREATIONAL (E.G. GAA)	1 (GAA-ALL PITCHES)	0	1 (GAA-1 PITCH)	1 (BRACEY'S NURSERY)
RAIL CROSSINGS (NEW STRUCTURES)	0	0	0	0
ROAD CROSSINGS (NEW STRUCTURES)	7	7	7	7
DIRECTLY AFFECTED PYLONS	2 (132KV)	2 (132KV)	2 (132KV)	2 (132KV)
AQUEDUCT	2 CROSSINGS	2 CROSSINGS	2 CROSSINGS	2 CROSSINGS
LOCAL ROAD CONNECTIONS (EXCLUDING FREE FLOWS)	2 (ROUNDABOUTS)	2 (ROUNDABOUTS)	2 (ROUNDABOUTS)	2 (ROUNDABOUTS)
APPROXIMATE LOCAL ROAD DEPARTURES (EXCLUDING FREE FLOWS)	2	2	2	2
TOTAL AREA OF THE SCHEME (EARTHWORKS EXTENT ONLY)	35.4HA	34.4HA	37.3HA	41.2HA

DESIGN FACTOR	OPTION 2	OPTION 3	OPTION 4	OPTION 5
LINK DESIGN SPEED / LENGTH	**120KPH/2.3KM**	**85KPH/1.6KM**	**85KPH/3.4KM**	**85 FIRST 0.9KM 120KPH REMAINING 1.9KM - 2.8KM OVERALL LENGTH TO CLOCK ROUNDABOUT**
VERTICAL GEOMETRY (RELAXATIONS)	NO RELAXATIONS	NO RELAXATIONS	NO RELAXATIONS	NO RELAXATIONS
HORIZONTAL GEOMETRY (RELAXATIONS)	1 - 1 STEP	1 - 2 STEP	3 - 3 AND 2 STEP	3 - 1 AND 2 STEP
VISIBILITY (RELAXATIONS)	0	1 - 1 STEP	0	1-2STEP
DEPARTURES	0	1	0	3
DIRECT IMPACT ON PRIVATE PROPERTIES	3	3	1	1
DIRECT IMPACT ON COMMERCIAL/RECREATIONAL (E.G. GAA)	0	0	1 (WICKHAM'S CLOSE)	0
RAIL CROSSINGS (NEW STRUCTURES)	0	0	2	0
ROAD CROSSINGS (NEW STRUCTURES)	7	5	7	8
DIRECTLY AFFECTED PYLONS	2 (132KV)	6 (132KV) 1 (400KV)	8 (132KV) 1 (400KV) *	6 (132KV) *
AQUEDUCT	2 CROSSINGS	3 CROSSINGS	2 CROSSING AND 960M DIVERSION	2 CROSSING AND 960M DIVERSION
LOCAL ROAD CONNECTIONS (EXCLUDING FREE FLOWS)	1 (ROUNDABOUT)	1 (ROUNDABOUT)	1 (ROUNDABOUT)	1 (ROUNDABOUT)
APPROXIMATE LOCAL ROAD DEPARTURES (EXCLUDING FREE FLOWS)	6	6	6	6
TOTAL AREA OF THE SCHEME (EARTHWORKS EXTENT ONLY)	32HA	17HA	30HA	28HA

1) FREE FLOWS ARE NOT INCLUDED IN GEOMETRIC ASSESSMENT, BUT ARE INCLUDED IN 'DIRECTLY AFFECTED PYLONS'.
2) * DIRECT IMPACT OF PYLONS; INDIRECT IMPACT OF PYLONS TBC.

NOTES

KEY

DRAFT FOR INFORMATION.

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project
WEST MIDLANDS AREA 9
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
PHASE 2 OPTIONS COMPARISON

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Client
Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
NTS	TO	DM/OM	GM	RJ
Original Size	**Date**	**Date**	**Date**	**Date**
A1	MAR 17	MAR 17	MAR 17	MAR 17

Status: SUITABLE FOR INFORMATION

Drawing No

Project	Originator	Volume	Location	Type	Role	Number
HE551485	MOU	GEN	M42_J6	DT	CH	0001

Suitability: S2
Revision: P01

filepath: W:\Highways\TRANSPORT - JOBS\1071038 M42_J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\HE551485-MOU-GEN-M42_J6-DT-CH-0001.dwg
plot date: 07/07/2017 14:13:49
by: Jamie Clift

Appendix F – Technical Notes & Design Narratives

Note

Technical Note: HE551485-MOU-GEN-M42_J6-FN-CH-0068 Appendices

- Appendix A included in the Technical Note is shown in Appendix A in this document as “Option 1 General Arrangement Drawing - HE551485-MOU-GEN-M42_J6-DR-CH-0004”.
- Appendix B included in the Technical Note is shown in Appendix H in this document as “Option 1 Traffic Flow Schematic – 2041 Peaks - HE551485-MOU-VTR-M42_J6-SK-CH-0008”.
- Appendix C included in the Technical Note is not shown in this document.

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Project:	M42 Junction 6 Improvement Scheme	**Date:**	31/05/17
		TN Ref:	0057
Subject:	M42 J6 Free flow links (previously Option 11A)		
Author:	Darren Morris/Oleg Makarov	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0057
Reviewed:	Graham MacNicol	**Date:**	31/05/17
Approved:	Graham MacNicol	**Date:**	31/05/17
Suitability:	Suitable for Information	**Status:**	S2
		Revision:	P01

Introduction

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

Description of Proposals

The free-flow left turn lanes as shown on all Option 1-3 drawings (see Appendix A of the SAR) were introduced to improve the traffic movement between the M42 and A45 and vice versa. The existing free-flow left turn between M42 northbound and A45 westbound is retained. The aim of the improvement was to reduce traffic on the circulatory carriageway, reduce vehicle conflicts and to improve signal timing at the junction.

The free-flow left turn in front of the NEC will allow the existing access and egress points to remain – thus introducing an underpass structure.

At the NMM however, there is an additional proposed arrangement for the NMM to have an egress at the rear of the museum which would then connect onto the A45 loop, under the A45 and exiting onto East Way, leading to Stonebridge Island. A CCTV camera survey at the NMM on Junction 6 carried out by Mouchel showed that while the amount of traffic exiting the NMM was not substantial, there were on occasions a number of unsafe manoeuvres which could potentially lead to accidents at this location. This alternative egress arrangement would remove traffic from the circulatory but will require agreement with associated parties - NEC, NMM, Highways England and SMBC. Further development of this option should be carried out in Stage 3.

Design Standards

- **TD9/93 – Highway Link Design** used for link road horizontal curvature radius in accordance with Table 3.
- **TD16/07 – Geometric Design of Roundabouts**
- **TD22/06 – Layout of Grade Separated Junctions**
- **TD27/05 – Cross-sections and Headrooms**

- **TD51/03 – Segregated Left Turn Lanes and Subsidiary Deflection Islands at Roundabouts**

Design Speeds

- Free flow left turns are designed to a 70kph design speed, unless greater than 750m in length then a 85kph design speed will be used
- East Way amendments to be confirmed as 60 to 70kph design speed, depending on the part of the network

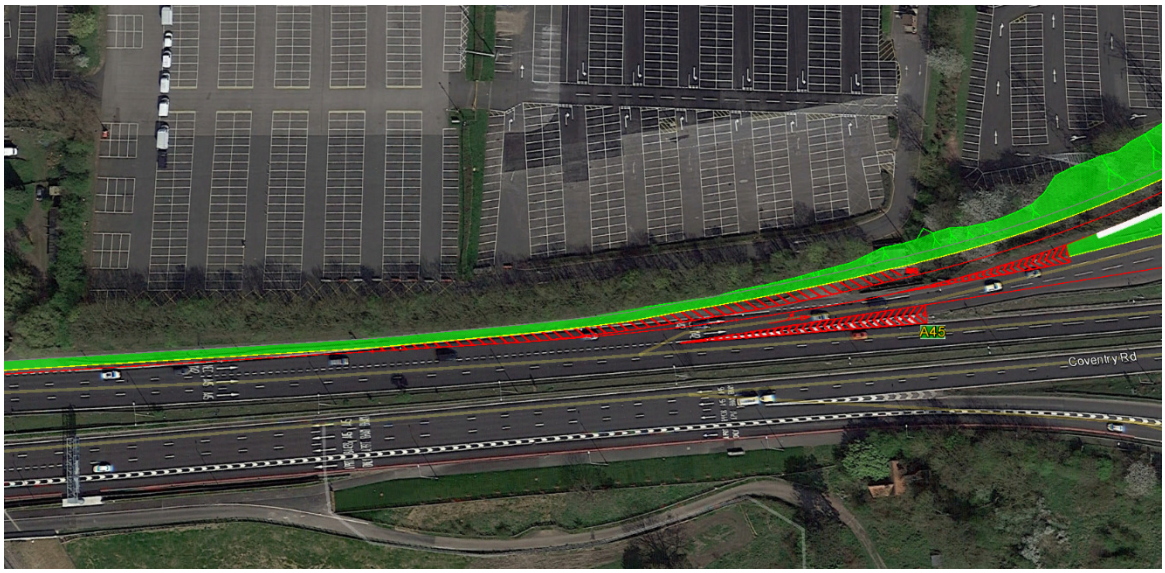
Geometry

Horizontal Alignment

Free flow lefts

A number of free flow left turns are proposed at junction 6 between the M42 and A45, each free flow is summarised below:

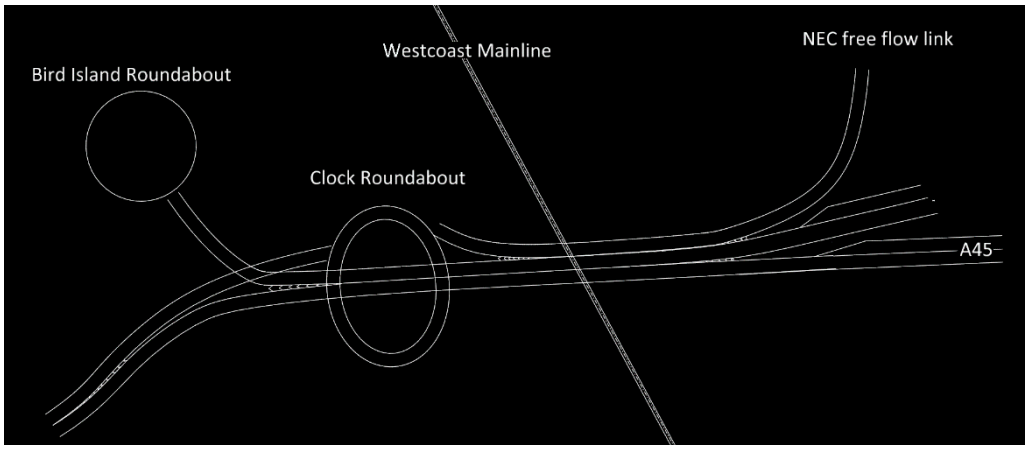
- **A45 E to M42 N** - The proximity of the successive diverges from A45 to J6 slip and the proposed diverge to the free flow link (75m instead of required 262.5m) would require a departure from standards. As the proximity of the Clock Interchange merge with A45 and A45 diverge to J6 is already at a substandard weaving length, there is a little scope to improve successive diverge distances. Initial option development for this free flow was based on the traffic figures for 2031 based on an old version of PRISM. The free flow was developed as a taper diverge, with taper developed within the extents of the eastbound diverge nose as shown below.



The 2031 PM peak flows show 825 vehicles continuing on A45 East and 1756 vehicles diverging to Eastbound Diverge of which 1164 would continue to the proposed free flow link. With such flow distribution it was considered that a safe layout can be achieved based on the arrangement above, considering that A45 in this location is Urban road with 50mph speed limit. The layout would also retain the existing A45 mainline layout, i.e. vehicles in Lane 1 are used to a lane drop to get access to Junction 6, with this proposal there would be an additional diverge for drivers to use.

The latest set of traffic flows (received in May 2017) for the Option 1 shows that in 2041 PM peak – the proposed A45 eastbound diverge slip road would carry some 3247 vehicles while A45 is taking 943 vehicle in

eastbound direction. Out of 3247 vehicles – 2789 are coming from Clock Interchange and Bird Island Roundabout 1554 from Bird Island roundabout and 1235 from Clock Interchange. Such high flow would require a different merge configuration at the merge from the Bird Island Roundabout – the existing merge should be changed from auxiliary lane merge to lane gain. A45 diverge to the Clock Roundabout would require a lane drop arrangement – this would reduce A45 to a single lane between Clock Roundabout Eastbound Lane Drop and Bird Island Roundabout Eastbound Lane Gain. A similar example of the close proximity successive diverges can be found west of Dublin at M50/N3 northbound diverge. The signing strategy, as highlighted by HE SES, will be paramount to design a safe free flow diverge. In the proposed layout the A45 is reduced to a single lane (offside lane) and 2 nearside lanes are dedicated to M42 J (M42 North, M42 South and NEC). The gantry at the tip of the Clock Junction EB merge would change to the following arrangement - nearside lane – M42 North, middle lane – M42 South and NEC, offside lane – A45 Coventry.



The free flow link incorporates a 400m left hand radius – a compliant radius with the required interchange link design speed 70kph - one step below the adjacent mainline. The offside channel is offset by a minimum 12m from the J6 circulatory nearside channel. It is assumed at this stage that this would provide a sufficient clearance for the construction to avoid impact on J6 circulatory.

The merge of the free flow link with M42 NB was developed as a Lane Gain as the predominant flow comes from the A45EB to M42NB free flow. A similar example can be found on M69/M1 northbound merge near Leicester. The latest traffic figures (received in May 2017) for Option 1 require Type G merge (2 Lane Gain with Ghost Island). However M42 widening to 5 lanes is not part of the scheme remit. A departure for under provision is required for the proposed type F merge. The existing northbound slip road would be redesigned as a type D merge.

Vertical alignment of the proposed free flow link has elements reduced by one step below desirable radius (20K crest is used at the back of the diverge nose). This is done in order to bring levels of the free flow link sufficiently down to provide headroom for the proposed structure at NEC access. As a result of the reduced vertical curve,–visibility will be reduced over a short distance for a low object to a minimum of 109m, but would remain within desirable minimum 120m to a high object. There is a rapid deviation between the free flow link and the A45 EB slip road levels - it would require a retaining wall as separation between adjacent carriageways as there is not sufficient room to provide earthworks slopes. A retaining wall is also likely to be required north of the Eastway Bridge to alleviate impact on the existing 400KV pylon – unless it can be diverted as part of the HS2 works.

Alignment of the northbound merge impacts HS2's People Mover pier. This has been discussed with HS2's design team. The HS2 People Mover pier would be moved into the proposed alignment verge - details to be confirmed at the preliminary design.

The free flow alignment impacts on the gas governor cabinet and 132Kv pylons at the diverge point from the A45 EB slip road. Further work will be required to avoid this impact during preliminary design.

The proposed slip road alterations impact on the existing Hollywell Brook culvert – the alterations to the culvert would also require assessment of the existing flood problems east and west of the culvert.
The impact on the existing gantries on M42 and slip road will require careful consideration – particularly as the point of merge would be altered.

- **M42 S to A45 E** – In order to provide compliant successive diverges on M42 SB diverge for 70kph design speed, the start of the proposed diverge is required to be moved some 250m north from the existing position. As a result weaving distance between J6 and J7 southbound would be 1670m, this would require a departure from standards.

  The M42 southbound diverge has been modelled as Type D Option 2 (TD22/06) – similar to the existing diverge layout, however the latest traffic flow information indicates that Type E – 2 Lane Drop layout is necessary for the M42 SB diverge. M42 widening to 5 lanes is not part of the scheme remit. This would therefore require an under provision departure from standards.

  It is not possible to provide the free flow merge with the existing A45 EB slip at a compliant position as the separation between Stonebridge Island and J6 is already substandard. So the J6 A45 EB merge cannot be extended further. The reduced successive merge distance would require a departure from standards. The proposed free flow will require replacement of the existing Eastway Bridge.

  The existing diverge form A45 EB merge slip road to DHL delivery depot and Middle Bickenhill cannot be maintained - access would be redirected via Eastway and Stonebridge roundabouts.

  Alignment of the southbound diverge impacts the HS2 People Mover piers. This has been discussed with the HS2 design team. HS2 People Mover pier will be moved into the proposed alignment verge - , details to be confirmed at preliminary design.

  The proposed slip road alterations impact on the existing Hollywell Brook culvert –alterations to the culvert require assessment of the existing flood problems east and west of the culvert.

  The impact on the existing gantries on M42 and slip road would require a careful consideration – particularly as the point of diverge would be altered.

- **A45 W to M42 S** – the proposed segregated lane/free flow link is designed to minimise impact on the NMM. **(NOTE** – due to budgetary constraints and potential departures, this link will not form part of the Preferred Route Announcement, an alternative arrangement for the NMM access would need to be considered at preliminary design stage, refer to the drawing HE551485-MOU-GEN-M42_J6-SK-CH-0037_P02).

The start position is determined by TD 22/06 in order to provide a compliant successive diverge distance between A45 diverge and diverge to the free flow link. The free flow diverge can be developed as a lane drop or taper diverge.

The link is designed with the offside channel positioned with a minimum 3m from the J6 circulatory nearside channel – there will be need for a lane closure on the existing circulatory in order to provide safe construction zone for the driven pile installation.

Horizontal alignment at the back of the diverge nose requires a 100m left hand radius – a five step reduction from the desirable minimum radius. The verge widening to the left would enable the required 120m SSD throughout the free flow link. An advisory 30mph speed limit maybe required, similar to the existing M42 northbound diverge free flow (90m horizontal radius with 90m SSD available).

The latest traffic figures received in May 2017 for Option 1 require Type F merge (Lane Gain with Ghost Island) - similar to the existing layout. The merge of the free flow link with M42 SB was developed as a Lane Gain as the predominant flow comes from the A45WB to M42SB free flow. A similar example can be found on M69/M1 northbound merge near Leicester. The merge position is constrained by the existing West Coast mainline overbridge. The existing southbound slip road would be redesigned as a type D merge (TD 22/06).

In order to provide sufficient headroom clearance with the NMM access – the proposed vertical alignment is required to be steepened to a minimum 20K crest and 9K sag curve; maximum longitudinal gradient is 6%. The vertical alignment takes advantage of the steep 6% downhill gradient on A45 WB diverge slip approach to the existing roundabout.

There is a rapid deviation between the free flow link and the J6 circulatory and NMM car park levels. This results in the requirement for a retaining wall (on both sides of the free flow link) as separation between adjacent carriageways and NMM land is not sufficient to provide an earthworks slope. The existing service road merge with A45 WB diverge cannot be maintained with the proposed arrangement and a diversion via Stonebridge Island will be required for local traffic – this is due to non-compliance with technical standards. The proposed low point of the segregated lane alignment is located directly below NMM access and is likely to require a pumping station to remove surface water.

- **M42 N to A45 W** – at present the parallel link from the existing free-flow link has been modified by the SMBC works. There are no plans to alter the new as-built layout as part of the M42 J6 free flow works. However, as proposed free flow links at J6 are part of Options 1, 2 and 3 – it is likely that the free flow left from M42 NB to the airport (currently segregated all the way to Clock Interchange) could be redundant due to the airport traffic using the proposed southern junction. It is possible that the layout of the M42 NB diverge would need to be amended. However, the retention of this link would add resilience on NEC major events days in particular.

Vertical Alignment

Proposed vertical alignment design is constrained by the extension of the cross fall where straight forward widening is provided. Where proposed alignment is situated outside of the existing widening requirements the design is constrained by Design Speed requirements and there is a need to provide adequate headroom clearance at NEC/NMM access structures.

Resulting vertical curvature on the segregated lane at NMM access is composed of as alignment adequate to 70 KPH design speed requirements - with the exception of the one step reduction in the crest curve and two step reduction in sag curve.

Vertical curvature of the proposed segregated lane from A45 EB to M42 NB is consistent with 70kph Design Speed requirements - with the exception of the one step reduction in the crest curve and one step reduction in SSD.

Non-standard Impacts

Refer to DfS checklist HE551485-MOU-GEN-M42_J6-DF-CH-0001_P02

Stakeholders

- NEC – free flow left under the NEC access/egress will have disruption during construction following reduced access provision
- NMM – as NEC, but consideration has been given to provide an additional entry and exit to the rear of the NMM during construction.
- NEC/NMM – should benefit from reduced flow passing through the circulatory due to the dedicated left turns.
- HS2 – access is as per the Hybrid Bill proposals, may benefit due to the reduced number of users at the circulatory due to the dedicated left turns.
- Birmingham Airport – as above for HS2, works currently being constructed as part of SMBC/BA improvements are to be modified.
- UKC – a connection to UKC is proposed off the improved East Way loop roundabout, UKC could benefit from the reduced flow on the circulatory.
- Network Rail – existing structure over the M42 is likely to be unaffected.
- Solihull Metropolitan Borough Council – proposals will impact A45 especially for the diverge/free flow to M42 N.
- Stats – M42 Junction 6 circulatory – a number of stats around the circulatory will be impacted as well as 132kV and 400kV pylons adjacent to the free flow A45 E to M42 N.
- Middle Bickenhill and DHL delivery depot

Traffic

Reference should be made to traffic schematic drawings HE551485-MOU-VTR-M42_J6-SK-CH-0001 which details the existing and do minimum turning movements at M42 Junction 6 as well as HE551485-MOU-VTR-M42_J6-SK-CH-0021 which details the turning movements at M42 Junction 6 with the free flow left turns.

Structures

There are 1no. existing bridge structure, 3no. 'major' retaining wall structures and 1no. culvert structure that will be affected by this option.

Culvert 11 Holywell Brook will be lengthened to accommodate the proposed road layout.

NEC Access Bridge (East Way)

This structure would need a significant modification or complete replacement to suit the new road layout. It is recommended that a new multi-span bridge structure should replace the NEC Access Bridge (East Way) in order to give further capacity of the road network. Material and type of the structure will be determined at Stage-3. Appropriate traffic management measures will be required during refurbishment/replacement of the bridge structure. As part of the NEC access bridge replacement two of the existing retaining walls adjacent to M42 may require relocation/replacement.

It is envisaged that the work will potentially cause the disruption to the road network in the form of the complete/partial road closure.

A new retaining wall to the west of M42 requires to protect 132kV power lines pylon unless pylon can be relocated to a safe distance away from the proposed road layout.

Smart motorway gantries and small retaining walls along the M42 could potentially be affected in the location of Free-Flow Links Option and will require to be modified to suit the new road layout. The locations, dimensions and types of the proposed retaining walls and gantries will be confirmed at the preliminary design.

In order to form the design layout, two new structures are also required:

Free Flow Link under the National Exhibition Centre Existing Access

It is intended to build an underpass structure which will carry the A45 eastbound traffic to M42 Northbound. The proposed structure comprises of boxed underpass structure with approaching retaining walls at each end. The superstructure will be supported by the deck-on-pile system (with secant piles) at the proposed location. However, the safe-working distance between the working site and the travelling publics should be confirmed at Stage-3. The feasibility of an offline construction method needs to be reviewed. The offline construction will minimise the traffic disruption and also increase the safety of the workforce. The approximate ground conditions for proposed structure can be obtained from GI report for M42 Interchange Bridges. However, the exact ground condition should be confirmed once the location of the structure is finalised.

Free Flow Links under the National Motorcycle Museum

(NOTE – due to budgetary constraints and potential departures, this link and the associated structure will not form part of the Preferred Route Announcement)

This structure will be identical to the proposed free flow link under the NEC. However, the length and height of the retaining walls may differ. The type, dimensions and maintenance strategy for the proposed structure will be confirmed at Stage-3.

Maintenance access arrangements and/or provisions have yet to be agreed but would need to be discussed with all relevant parties to ensure the design incorporates maintenance requirements.

Geotechnical

Some sections of the proposed new free flow links around Junction 6 impinge onto areas of Made Ground associated with the construction of the NEC and the M42.

The extent and nature of the Made Ground is not known and would be established during ground investigation along with the rest of the ground conditions. The presence of the Made Ground is a manageable risk.

Environment

There is risk that Option 11A will result in air quality, noise and visual impacts to sensitive receptors in Bickenhill and the wider area. Further survey and modelling work including the development of mitigation measures is required to resolve this. These measures should also be designed to mitigate impacts to cultural heritage assets.

This option has potential impacts on European Protected Species. Further survey and assessment work is required to confirm the presence of these species or habitat for other species, to determine likely impacts and develop suitable

mitigation measures. It is anticipated that suitable drainage and flood compensation will be designed during PCF Stages 2 and 3 to avoid impacts to the water environment.

Risks/Hazards

- Departures from standard required which need to be submitted to Highways England and SMBC
- Existing gantries along M42 mainline to be extended/replaced/repositioned
- M42 localised widening may fall outside of existing highway boundary.
- Local road networks will be impacted by the proposals the extent of which is still to be determined via traffic modelling.
- Impact to flood zones 2 and 3 refer to Environmental Constraint Drawings HE551485-MOU-EGN-M42_J6-DR-LE-0025 & 0026
- Proposals over areas of soft ground, made ground and landfill.
- Impact to a number of 132kV and 400kV pylons
- Impact to NEC and NMM day to day business during construction of underpasses/tunnels
- Replacement of existing East Way Bridge, tight construction room and disturbance of NEC business
- HS2 People Mover pier locations will need to alter due to north facing slip provisions
- The new connection from the existing dedicated left for East Way from M42 southbound diverge to the A45 may cause some conflicting movements from vehicles when trying to merge with the A45 traffic.
- Note – at this time impact to existing PRoWs and National Trails have not been determined.

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Project:	M42 Junction 6 Improvement Scheme	**Date:**	25/05/2017
		TN Ref:	0059
Subject:	Option 1		
Author:	Oleg Makarov	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0059
Reviewed:	Graham MacNicol	**Date:**	31/05/17
Approved:	Graham MacNicol	**Date:**	31/05/17
Suitability:	Suitable for Information	**Status:**	S2
		Revision:	P01

Introduction

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

Description of Proposals

Option 1, as shown on drawing HE551485-MOU-GEN-M42_J6-DR-CH-0004, comprises of a new dumb-bell roundabout (southern junction) with a dual carriageway link towards Birmingham Airport and Clock Interchange. The access to and from Catherine de Barnes Lane and Bickenhill village is accommodated via two staggered slip roads connecting to Catherine de Barnes lane via two new roundabouts. The dumb-bell layout southern junction comprises of a large western roundabout (enabling MSA connection) and a smaller eastern roundabout. South facing slip roads designed as a ghost island merge/diverge layout. North facing slip roads designed as simple Taper merge/diverge layout.

The design of the southern junction has taken into account the potential for the new motorway service area that is proposed at the same location. Although the MSA has not yet been approved by the planning authority, aspects of their proposed design has been considered in order to avoid abortive works. In the event of MSA junction becoming operational prior to the commencement of the M42 J6 improvement scheme – the buildability of the new scheme becomes a paramount concern. If the requirements of the proposed M46 J6 improvement scheme are not taken into account – the construction would require a prolonged closures of the MSA, with significant cost implications.

Option 1 directly impacts the Gaelic Athletic Associations (GAA) sports ground, the implication of this was established during the non-statutory public consultations. The GAA site is the home fo Gaelic games in the UK and also hosts national games. Due to the extensive impact on the GAA sports ground a number of alternative alignments has been considered and assessed. Four options have been developed to avoid GAA grounds – Options 1 (original alignment), 1A, 1B, 1C. Option 1 cuts through the middle of the GAA ground, Option 1A avoids GAA by deviation to the west of the sports fields. Option 1B cuts through the eastern field only and Option 1C avoids GAA by deviation to the east of the sports fields. The preferred option assessed in the SAR is Option 1.

However, as negotiations are ongoing with GAA regarding potential land acquisition, Highways England are recommending Option 1B as the recommended option for Public Route Announcement by the Secretary of State.

Design Standard

- **TD9/93 – Highway Link Design**
- **TD16/07 – Geometric Design of Roundabouts**
- **TD22/06 – Layout of Grade Separated Junctions**
- **TD27/05 – Cross-sections and headrooms**
- **TD42/95 – Geometric Design of Major/Minor Priority Junctions**

Note: Design Standards to be expanded as design options progress

Geometry

Design Speed

- Slip roads are to be 70kph unless length of slip road is greater than 750m then it will be designed to an 85kph design speed
- Dual Carriageway link from the MSA roundabout to Clock Interchange Roundabout to be designed as 120kph,
- Link to connection from the proposed dual carriageway to the Airport Way flyover link is designed as a single carriageway link for 70kph design speed. The existing Airport Way has speed limit of 40mph – 70kph design speed.
- Existing Catherine de Barnes Ln has 50mph – 85kph design speed. The proposed Catherine de Barnes on the approaches to proposed roundabouts is designed to 85kph design speed.
- Dumb-bell Link Road as 70kph

Alignment

Slip road layouts

The design speed of the slip road has been based on TD 22/06 and a design speed of 70kph has been adopted.

The location of the new southern junction has been based on the location of the existing M42 junctions – namely Junction 5 and Junction 6 – as well as the predicted traffic flows. The new junction is approximately equidistant between existing Junctions 5 and 6. This has resulted in the junction being located approximately 2km south of the existing Junction 6 and results in Departures from Standard (DfS) for weaving length between M42 Junction 5 and the new southern junction (circa 1800m to 1900m) and new southern junction to M42 Junction 6 (circa 1100m). The compliant weaving length should be 2km as defined in Clause 4.35 of TD 22/06.

However, as the MSA design has received a DfS approval in principle regarding the reduced weaving length between the new MSA junction and Junction 6, these departures are considered to be acceptable – subject to similar traffic levels. The main reason for the MSA departure approval is related to the low traffic movements associated with the MSA in comparison with a full mainline grade separate junction. If the MSA application does not get approval or is delayed prior to construction of M42 Junction 6, then there is an option to construct the north facing slip roads but block their access – as there will be no requirement for traffic to use them except for emergency purposes. Alternatively the north facing slips could be completely removed. Future use can then be determined on provision of ALR within future Smart Motorway schemes on this section of the M42. It should be noted in the MSA doesn't get approval the current dumb-bell arrangements could be re-sized to reduce overall costs, land take and impact to the environment.

A separate technical note has been produced highlighting the impact of the emerging 2041 traffic results on the New Southern Junction – reference HE551485-MOU-GEN-M42_J6-FN-CH-0068.

The original MSA scheme proposed a taper merge on M42 southbound and taper diverge on M42 northbound, both in a single lane slip road arrangement. However the increase in traffic would require northbound as a Ghost Island diverge for Lane Drop and southbound as a Lain Gain with Ghost Island merge layout. At this stage, the scheme does not consider M42 widening to 5 lanes - hence it would not be possible to provide Lane Gain or Lane Drop on south facing slip roads. A departure for an under-provision on the northbound diverge and southbound merge would be required. On the southbound merge it may be possible to provide a merge type H layout in order to mitigate the under-provision departure.

The vertical alignment of the proposed slip roads is likely to differ with the current MSA junction design. Horizontal changes would likely require additional earthworks and new pavement widening. There is also an impact on the proposed Solihull Road B4102 bridge as the visibility splay requirement and position of the slip road affects the proposed structure. Alterations to south facing slip roads would affect proposed M42 signing strategy currently developed for MSA.

The extent of the north facing slip roads would likely to remain the same as in the current MSA proposal and as such would not affect Shadowbrook Ln overbridge structure.

In order to avoid impact on the Shadowbrook Ln overbridge the proposed northbound merge requires a shorter length of the taper – 160m instead of the required by TD22 205m taper. This would require a departure from standards. A similar proposal has been shown in the MSA proposed design drawings.

In order to reduce the environmental impact, where the proposed south facing slip roads are positioned in the vicinity of the ancient woodland – the design of the proposed earthworks has been done with a 1 in 1 slope (similar to theMSA design).

MSA dumbbell roundabout GSJ

The design of the southern junction has taken into account the potential that the proposed MSA will be constructed at the same location by the developer in advance of the M42 Junction 6 Improvement scheme. Although the MSA has not yet been approved by the planning authority, aspects of their proposed design have been considered in order to avoid abortive works.

To incorporate the new link road to Clock Interchange (and potential new MSA connection), the western roundabout size has been developed to the maximum recommended size in TD 16/07 (100m inscribed circle diameter). An ARCADY (Assessment of Roundabout Capacity and Delay) analysis was undertaken on the new southern junction with and without the MSA. It shows that without the MSA the western and eastern dumb-bell roundabout have spare capacity. When considering a new southern junction with an MSA, the western dumbbell entry from M42 northbound diverge and entry from the MSA are over the recommended ratio of flow to capacity (RFC = 0.85), by 0.97 and 1.76 respectively.

It is recommended that the ARCADY analyses are re-run once the micro-simulation (VISSUM) traffic modelling has been completed. Consideration can be given to widening entry widths but this is likely to result in an ICD over the recommended size. In terms of impact to the MSA, discussions should be held with the developer on the interaction with their planning application.

Link to Airport

The design speed of the link is 120kph (70mph) which is based on a dual carriageway layout. The free-flow left turn to Airport Way is designed as a slip road with a 70kph (40mph) design speed.

The link is aligned to avoid the local village of Bickenhill with a horizontal curvature to the west of the village - which also includes a free-flow left link to Airport Way. The minimum radius proposed on the dual link is approximately 900m, with a 127m radius proposed for the Airport Way free-flow left turn.

Although the 127m radius is a DfS for a 70kph design speed, it is necessary to connect the proposed link with the existing airport free-flow link to avoid impacting the existing structure. The free-flow left should be developed with a taper diverge and a reduced speed limit, signed clearly at the back of the near straight. This should emphasise the message to the driver that they have left the dual carriageway. The free-flow left merges into existing Lane 1 of Airport Way as a lane gain (to remove merge conflict points) reducing to one lane further upstream. Downstream of the proposed lane gain two lanes would be available which is the same as the existing layout.

Local road connections occur via two new roundabouts. These allow connection to the new dual link in each direction but still discourage the use of the link for rat-running which is a local concern.

Vertical alignment of the proposed link from MSA roundabout to Clock roundabout is designed predominantly in deep cutting in order to minimise visual and environmental impact on Bickenhill and the surrounding countryside. Such an approach would also facilitate a simpler connection with Catherine de Barnes (CdB) Lane and minimise impact on the adjacent properties. Design of the vertical alignment ensures that drainage can be designed with positive outfalls to Shadowbrook and Hollywell Brook although some thought is required during preliminary design to avoid flat spots at the required super-elevation rollovers.

Clock Roundabout

The provision of a new connection from the proposed southern junction to Clock Roundabout and Airport free flow would inevitably change traffic patterns on the Clock junction (consisting of 4 roundabouts). The detailed microsimulation model and LinSig model would provide more clarity of the extent of a potential problem and any remediation required (to be considered at the preliminary design.)

At the outline design stage, a proposal for improvements to Clock Roundabout and the adjacent links was developed. The existing circulatory was increased from 2 to 3 lanes within the extents of the structures. This was done by utilising full width of the structures and removing existing footpaths from the bridges. Footpaths will be moved to a new footbridge adjacent to the eastern structure.

It is worth pointing out that initial discussion with SMBC has concluded the western structure footpath as an ‘unused NMU facility’. Existing structures and parapets would require an assessment at preliminary design in order to ensure feasibility of such a proposal.

Bickenhill Lane link north of the Clock roundabout would be widened westwards (away from the Birmingham Business Park land) – southbound direction would be enabled for 4 lanes and northbound for 3 lanes. Initial ARCADY analysis shows that the improved Clock Roundabout would fail in the 2041 design year. The subsequent signalised junction assessment in LinSig demonstrates adequate capacity if the proposed improvement at the Clock Roundabout is implemented. The northbound approach of the proposed Link to Clock Roundabout is required to have 3 lanes in the immediate roundabout vicinity. The outline design shows that 3x3m lanes on the approach to the signals can be accommodated within the existing flyover structure cross section.

A separate technical note has been produced highlighting the impact of the emerging 2041 traffic results on Clock Interchange – reference HE551485-MOU-GEN-M42_J6-FN-CH-0069.

Bickenhill Roundabout and CdB southbound diverge slip.

In order to provide access to CdB lane and Bickenhill village in a southbound direction from Clock Interchange – a taper diverge slip road is proposed 450m south of the Clock Interchange roundabout. The slip road would connect to CdB Lane via a new roundabout with an arm on the west to the gain access to the local caravan park and properties at the end of Clock Lane. The main access to Bickenhill village would be provided via St Peters Lane. Size and position of the roundabout to be considered at preliminary design. Visibility requirements on the proposed off slip road would require a considerable retaining wall (over 200m long) in order to minimise the impact on Bickenhill village.

CdB northbound merge slip to the proposed link.

In order to provide access from CdB lane to the new link road and Clock Roundabout in a northbound direction a new roundabout is proposed 100m east of the Birmingham Dog Home. The roundabout would be designed as 3 arm. Although a design with a simple off slip from Catherine de Barnes to the new link northbound has been considered, the diversion required for Bickenhill residents wishing to go north is considered too long – over 5km. Size and position of the roundabout to be considered at preliminary design. Care is required in vertical design of the roundabout to minimise impact on the adjacent Esso fuel pipeline. The outline design positions proposed an alteration between the two proposed roundabouts at a slightly different alignment to existing – this is done in order to minimise skew angle of the proposed overbridge and impact on private property.

Free flow lefts at J6

Refer to design narrative for the Option 11A - HE551485-MOU-GEN-M42_J6-FN-CH-0057

Non-standard Impacts

Refer to DfS checklist HE551485-MOU-GEN-M42_J6-DF-CH-0001_P02

Stakeholders

- Birmingham Airport – direct link from the proposed southern junction to Airport Way. Access from the north would be as per existing flyover arrangement;
- Birmingham International Railway Station – direct link from the proposed southern junction via Clock Interchange;
- Natural England – impact on Ancient Woodland - Aspbury's Copse;
- Bickenhill residents – link road passes close to the village;
- Catherine de Barnes residents
- Birmingham Dogs Home
- Solihull Metropolitan Borough Council

Traffic

The impact of the 2041 traffic results analysis using the Option 1 design are captured in three technical notes and they highlight the impact of the emerging 2041 traffic flows to the three main junctions, however, the micro-simulation modelling is still to be completed:

- New Southern Junction - HE551485-MOU-GEN-M42_J6-FN-CH-0068
- Clock Interchange - HE551485-MOU-GEN-M42_J6-FN-CH-0069
- M42 Junction 6 - HE551485-MOU-GEN-M42_J6-FN-CH-0070

Structures

There are 3no. existing bridge structures (one belongs to Solihull Metropolitan Borough Council) and 1no. culvert structure that will be affected by this option.

The Shadow Brook Lane overbridge will have less impact on the scheme as it is expected to tie into the proposed road alignment. The existing bridge structure comprises of a two-span reinforced concrete beam deck which is supported by the abutments and central pier. The structure may need to be widened if the new alignment does not tie into the proposed road alignment.

Due to the new junction proposed at the south of Junction 6, the length of the existing culvert (Outfall No.19) will not be able to accommodate the proposed highway alignment. Hence, the culvert needs to be widened.

Smart motorway gantries and small retaining walls will be affected by the location of Option 1 and will need to be modified to suit the new road layout. It should be noted that the widening of existing structures will also influence the existing pylon locations – resulting in possible pylons relocation.

In order to form the design layout, four new structures are also required:

Reconstruction of Solihull Road Bridge

The existing Solihull Road Bridge will not be suitable for the new road alignment but a new structure can be located beside the existing structure. The existing bridge will be demolished once the new bridge is in operation. This structure will be of a similar form as the new Junction Bridge – resulting in some disruption to existing traffic. The approximate ground conditions for the proposed bridge structure can be obtained from the GI report for Solihull Road Bridge (kept by the Area 9 Maintaining Agent). However ground conditions should be confirmed by the geotechnical investigation once the location of the structure is finalised.

New Southern Junction Overbridge

The newly proposed southern junction 6 has been designed as a dumbbell interchange over the M42. The structure will be a two-span bridge structure. The preferred option is the use of precast elements similar to the existing Solihull Road Bridge. The abutments and pier will be cast-in-situ at the proposed locations. The prefabricated elements can then be lifted into position. This solution will minimise disruption to traffic. The ground conditions for proposed bridge structure can be obtained from GI report for Solihull Road Bridge but are summarised in the geotechnical section below. Ground conditions will need to be confirmed via a GI, however, it is expected the structure will be located in an area of alluvium.

Catherine de Barnes Lane Over-Bridge

The structure is envisaged to be a highly skewed single span bridge that carries the new M42 Link Road over Catherine de Barnes Lane. The abutments will be built on either side of Catherine de Barnes Lane. The bridge deck will be constructed offline to minimise disruption to traffic and then lifted into position. No precise geotechnical information is available for the proposed structure location. This information needs to be identified after the geotechnical investigation at preliminary design stage

New Overbridge (Bickenhill)

This single span structure can be built offline during the construction phase. Hence, both precast or in situ options can be adopted for construction. No geotechnical information is available for proposed construction location. The information needs to be identified from the geotechnical investigation at preliminary design stage

Maintenance access arrangements for heavy vehicles on the local road network have yet to be agreed but would need to be discussed with all relevant parties to ensure the design incorporates maintenance requirements.

Geotechnical

The area of the new junction on the M42 will be located over areas of Alluvium which is likely to be weak and/or compressible.

Made ground associated with a historic landfill may underlie the tie in with the Clock Interchange and the link to the Clock Interchange impinges slightly onto a strip of land identified as former landfill where the route is in cutting. Should contaminated former landfill material be encountered and require removal to off-site landfill, additional disposal cost may be incurred.

The extent and nature of the Alluvium and Made Ground is not known and would be established during ground investigation along with the rest of the ground conditions. The presence of the Alluvium and Made Ground is a manageable risk.

Environment

There is risk that Option 1 will result in air quality, noise and visual impacts to sensitive receptors in Bickenhill. Further survey and modelling work including the development of mitigation measures is required to resolve this. These measures should also be designed to mitigate impacts to cultural heritage assets.

Option 1 severs playing fields which are used for National Gaelic Football matches. Further mitigation design is required to prevent the options precluding future use of this community facility. The option variants have been described earlier in this note.

This option has potential physical impacts on Castle Hill Farm Meadows LWS, Meadows to the east of the Jungle Ecosite, Clock Lane Meadows Ecosite, Roadside Hedge Ecosite and Aspbury's Coppice Ancient Woodland/LWS/Ecosite. Further survey work is required to categorise the importance of these sites both for their floristic interest and as habitat for other species, such as bats and invertebrates, to determine likely impacts and develop suitable mitigation measures.

It is anticipated that suitable drainage and flood compensation will be designed during PCF Stages 2 and 3 to avoid impacts to the water environment.

Risks/Hazards

- Departures from standard required which need to be submitted to Highways England and SMBC
- Link road close to Bickenhill Village and access arrangements amended for Bickenhill due to stopping up of St Peters Lane/Catherine de Barnes Lane Junction
- Existing structures to be demolished and/or replaced at Solihull Road
- Local road networks will be impacted by the proposals the extent of which is still to be determined via traffic modelling.
- Impact to flood zones 2 and 3.
- Ancient Woodland impacted by scheme.
- Proposals over areas of soft ground, made ground and landfill which needs to be confirmed via ground investigations
- Potential diversion works for 132kV pylons as well as aqueduct

- Note – at this time impact to existing PRoWs and National Trail have not been determined. The provision of link connecting to Airport freeflow would block the existing footway/cycleway along the existing flyover. Details of the alternative arrangement may require an additional underpass structure.

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Project:	M42 Junction 6 Improvement Scheme	**Date:**	08/11/2016
		TN Ref:	0060
Subject:	Option 2		
Author:	Oleg Makarov	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0060
Reviewed:	Graham MacNicol	**Date:**	18/11/16
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Suitability:	Suitable for Information	**Status:**	S2
		Revision:	P01

Introduction

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

Description of Proposals

Option 2, as shown on drawing HE551485-MOU-GEN-M42 J6-DR-CH-0008, it is designed with a dual link towards Birmingham Airport and the Clock Interchange. The access to and from Catherine de Barnes Lane and Bickenhill village is accommodated via the proposed Bickenhill roundabout.

Due to the potential conflict of a proposed MSA junction with the new southern junction, we have adapted our design to accommodate a potential multi-use junction with the MSA and avoid possible abortive works in the future - subject to MSA planning application being approved.

Design Standard

- **TD9/93 – Highway Link Design**
- **TD16/07 – Geometric Design of Roundabouts**
- **TD22/06 – Layout of Grade Separated Junctions**
- **TD27/05 – Cross-sections and headrooms**
- **TD42/95 – Geometric Design of Major/Minor Priority Junctions**

Note: Design Standards to be expanded as design options progress

Geometry

Design Speed

- Slip roads are to be 70kph unless length of slip road is greater than 750m then it will be designed to an 85kph design speed.
- Dual Carriageway link from the MSA roundabout to the proposed Bickenhill Roundabout to be designed as 120kph.
- Connection from the proposed Bickenhill Roundabout to the Airport Way flyover link is designed as a single carriageway link for 70kph design speed. The existing Airport Way has speed limit of 40mph – 70kph design speed.
- Link from the proposed Bickenhill Roundabout to the existing Clock Interchange to be designed as a dual carriageway with 70kph design speed.
- Existing Catherine de Barnes Lane has 40mph – 70kph design speed. The proposed link from Catherine de Barnes Lane to the proposed Bickenhill Roundabout is designed as a single carriageway with 70kph design speed.
- Dumb-bell Link Road as 70kph.
- Existing Shadowbrook Lane in the vicinity of the proposed diversion has 40mph speed limit. The proposed Shadowbrook Lane design for 70kph design speed.
- Existing Church Lane in the vicinity of the proposed diversion appears to have derestricted speed limit but the nature of the existing single track lane with passing places would allow for a maximum 50kph design speed.

Alignment

Slip road layouts

The design speed of the slip road has been based on TD 22/06 and a design speed of 70kph has been adopted.

The location of the new southern junction has been based on the location of the existing M42 junctions – namely Junction 5 and Junction 6 – as well as the predicted traffic flows. The new junction is approximately equidistant between existing Junctions 5 and 6. This has resulted in the junction being located approximately 2km south of the existing Junction 6 and results in Departures from Standard (DfS) for weaving length between M42 Junction 5 and the new southern junction (circa 1800m to 1900m) and new southern junction to M42 Junction 6 (circa 1100m). The compliant weaving length should be 2km as defined in Clause 4.35 of TD 22/06.

However, as the MSA design has received a DfS approval in principle regarding the reduced weaving length between the new MSA junction and Junction 6, these departures are considered to be acceptable – subject to similar traffic levels. The main reason for the MSA departure approval is related to the low traffic movements associated with the MSA in comparison with a full mainline grade separate junction. If the MSA application does not get approval or is delayed prior to construction of M42 Junction 6, then there is an option to construct the north facing slip roads but block their access – as there will be no requirement for traffic to use them except for emergency purposes. Alternatively the north facing slips could be completely removed. Future use can then be determined on provision of ALR within future Smart Motorway schemes on this section of the M42. It should be noted in the MSA doesn't get approval the current dumb-bell arrangements could be re-sized to reduce overall costs, land take and impact to the environment.

The original MSA scheme proposed a taper merge on M42 southbound and taper diverge on M42 northbound, both in a single lane slip road arrangement. However the increase in traffic would require northbound as a Ghost Island diverge for Lane Drop and southbound as a Lane Gain with Ghost Island merge layout. At this stage, the scheme does not consider M42 widening to 5 lanes - hence it would not be possible to provide Lane Gain or Lane Drop on south facing

slip roads. A departure for an under-provision on the northbound diverge and southbound merge would be required. On the southbound merge it may be possible to provide a merge type H layout in order to mitigate the under-provision departure.

The vertical alignment of the proposed slip roads is likely to differ with the current MSA junction design. Horizontal changes would likely require additional earthworks and new pavement widening. There is also an impact on the proposed Solihull Road B4102 bridge as the visibility splay requirement and position of the slip road affects the proposed structure. Alterations to south facing slip roads would affect proposed M42 signing strategy currently developed for MSA.

The extent of the north facing slip roads would likely to remain the same as in the current MSA proposal and as such would not affect Shadowbrook Lane overbridge structure.

In order to avoid impact on the Shadowbrook Lane overbridge the proposed northbound merge requires a shorter length of the taper – 160m instead of the required by TD22/06 205m taper. This would require a departure from standards. A similar proposal has been shown in the MSA proposed design drawings.

In order to reduce the environmental impact, where the proposed south facing slip roads are positioned in the vicinity of the ancient woodland – the design of the proposed earthworks has been done with a 1 in 1 slope (similar to the MSA design).

MSA dumbbell roundabout GSJ

The design of the southern junction has taken into account the potential that the proposed MSA will be constructed at the same location by the developer in advance of the M42 Junction 6 Improvement scheme. Although the MSA has not yet been approved by the planning authority, aspects of their proposed design have been considered in order to avoid abortive works.

To incorporate the new link road to Clock Interchange (and potential new MSA connection), the western roundabout size has been developed to the maximum recommended size in TD 16/07 (100m inscribed circle diameter).

It is recommended that the ARCADY analyses is run once the micro-simulation (VISSUM) traffic modelling has been completed.

Link to Airport

The link is aligned to the east of Bickenhill village. The proposed link has a minimum horizontal radius of 720m which is one step below the desirable minimum (1020m). With minimum desirable SSD maintained - this is considered an acceptable relaxation in order to minimise impact to the surrounding area.

The vertical alignment has been designed so that the level of existing local roads at the Shadowbrook Lane and Church Lane can be retained. This results in long lengths of cutting and in particular, a deep cutting at the Shadowbrook Lane and Church Lane road crossings. In the middle of the proposed link – alignment is elevated by up to 9m above the existing ground level which in turn impacts on the openness of the green belt and is visually intrusive.

Proposed Bickenhill Roundabout

It is not possible to connect the proposed Airport Link directly with Clock Junction as it is done in Option 1. Because of the approach angle it is necessary to introduce a roundabout to enable a sharp change in the alignment curvature. It is also necessary to introduce the proposed roundabout in order to provide access to CdB Lane. The size of the roundabout will be based on traffic modelling and alignment design to provide a safe and efficient layout, it is currently shown with a 100m inscribed circular diameter.

Dumb-bell Link

A dumb-bell link connection between existing Clock Interchange and the new Bickenhill Roundabout, this will be a dual link, with the exit from the new roundabout with an additional lane which drops to Airport Way. The southbound visibility on the link will be restricted by the existing structure to a minimum of 35m, in order to improve this an alteration to the existing flyover structure will be required. The lane drop to Airport Way in northbound direction situated 80m from the roundabout exit, this is a substantial reduction to the 262m weaving distance requirements for 70kph design speed. In order to provide a sufficient manoeuvring distance the lane designation has to be introduced within the Airport Link approach to the proposed Bickenhill roundabout – the offside lane should be marked with Clock Junction designation and the nearside lane should be marked designated to Airport and Bickenhill. A similar lane dedication would be required on the proposed CdB Lane approach.

The connecting link from the Bickenhill Roundabout to Airport Freeflow requires a 127m left hand bend radius in order to provide sharp change in direction to the Airport freeflow. Vertical alignment of this link is determined by extensions of the cross fall from the dumb-bell link and the airport free flow link. Connection with the existing flyover can be done as a taper merge prior to the existing A45 viaduct, but a safer fay would reduce existing flyover dual link to a single lane link to enable the proposed link from the Bickenhill roundabout to be a lane gain.

Local Roads

Shadowbrook Lane and Church Lane require some realignment at the point of crossing with the proposed Airport Link. It will be possible to retain alignment in the existing lane position but in order to improve buildability it is proposed to realign the existing lanes in order to build proposed structure offline. Horizontal and vertical curvature of both Shadowbrook Lane and Church Lane are adequate to the existing speed limit.

Free flow lefts at J6

Refer to design narrative for the Option 11A - HE551485-MOU-GEN-M42_J6-FN-CH-0057.

Non-standard Impacts

Refer to DfS checklist HE551485-MOU-GEN-M42_J6-DF-CH-0001_P02.

Stakeholders

- Birmingham Airport – direct link from the proposed southern junction to Airport Way. Access from the north would be as per existing flyover arrangement;
- Birmingham International Railway Station – direct link from the proposed southern junction via Clock Interchange;
- Natural England – impact on Ancient Woodland - Aspbury's Copse;
- Bickenhill residents – link road passes close to the village;

Traffic

The table below presents a summary of the emerging 2041 traffic results and the impact on the New Southern Junction in particular the slip road layouts and number of lanes on the mainline:

New Southern Junction Northbound Diverge	Traffic Flows		Slip Road Layout as per TD 22 Figure 2/5 MW	Number of Lanes Required as per TD 22 Figure 2/5 MW	
	Mainline	Slips		Upstream	Downstream
AM Peak	7227	1332	A	5	5
Inter Peak	5431	636	A	4	4
PM Peak	6231	996	C	5	4
New Southern Junction Northbound Merge	**Traffic Flows**		**Slip Road Layout as per TD 22 Figure 2/3 MW**	**Number of Lanes Required as per TD 22 Figure 2/3 MW**	
	Mainline	**Slips**		**Upstream**	**Downstream**
AM Peak	7227	0	A or D	5	-
Inter Peak	5431	0	A or D	4	-
PM Peak	6231	0	A or D	4	-
New Southern Junction Southbound Diverge	**Traffic Flows**		**Slip Road Layout as per TD 22 Figure 2/5 MW**	**Number of Lanes Required as per TD 22 Figure 2/5 MW**	
	Mainline	**Slips**		**Upstream**	**Downstream**
AM Peak	6393	171	A	4	4
Inter Peak	5100	66	A	3	3
PM Peak	5848	415	A	4	4
New Southern Junction Southbound Merge	**Traffic Flows**		**Slip Road Layout as per TD 22 Figure 2/3 MW**	**Number of Lanes Required as per TD 22 Figure 2/3 MW**	
	Mainline	**Slips**		**Upstream**	**Downstream**
AM Peak	6393	896	E	4	5
Inter Peak	5100	895	E	3	4
PM Peak	5848	421	A or D	4	4

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Structures

There are 3no. existing bridge structures (one belongs to Solihull Metropolitan Borough Council), 1no. culvert structure and 1no. retaining wall structure that will be affected by this option.

P29A will need to be removed or relocated to suit the new road layout. Smart motorway gantries and small retaining walls will be affected by the location of Option 2 and will need to be modified to suit the new road layout. Additionally, this option affects a number of local roads which belong to Solihull Metropolitan Borough Council. The conditions and load carrying capacities should be confirmed in Stage-3. It should be noted that the widening of existing structures will also influence the existing pylon locations – resulting in possible pylons relocation.

In order to form the design layout, seven new structures are also required:

Reconstruction of Solihull Road Bridge

The existing Solihull Road Bridge will not be suitable for the new road alignment but a new structure can be located beside the existing structure. The existing bridge will be demolished once the new bridge is in operation. This structure will be of a similar form as the new Junction Bridge – resulting in some disruption to existing traffic. The approximate ground conditions for the proposed bridge structure can be obtained from the GI report for Solihull Road Bridge (kept by the Area 9 Maintaining Agent). However ground conditions should be confirmed by the geotechnical investigation once the location of the structure is finalised.

New Southern Junction Bridge over the M42

The newly proposed southern junction 6 has been designed as a dumbbell interchange over the M42. The structure will be a two-span bridge structure. The preferred option is the use of precast elements similar to the existing Solihull Road Bridge. The abutments and pier will be cast-in-situ at the proposed locations. The prefabricated elements can then be lifted into position. This solution will minimise disruption to traffic. The approximate ground conditions for proposed bridge structure can be obtained from GI report for Solihull Road Bridge. However initial geotechnical investigation identified the proposed junction will be located over areas of Alluvium which is likely to be weak and/or compressible (see Geotechnical Hazard Plan). The ground condition should be confirmed once the location of the structure is finalised.

Over Shadowbrook Lane Bridge

The preferred option is to build a single span reinforced concrete bridge over Shadowbrook Lane to minimise disruption to traffic at Shadowbrook Lane. Alternatively, a bridge could be built parallel to Shadowbrook Lane over the new road. The alternative option will divert the traffic of Shadowbrook Lane through the new bridge to accommodate the new road layout. This option will also minimise disruption to the travelling public. The type, dimensions and maintenance strategy for the new structure will be confirmed at Stage-3. No geotechnical information is available for the proposed construction location. The information needs to be identified after the geotechnical investigation at preliminary design stage.

Bridge over the private/local road adjacent to Shadowbrook Lane

The proposed road layout crosses a frequently used private road. Hence, maintaining the access to the private road will be required, especially during and after construction of the new road. Precast box culverts is a preferred option which can be buried under the proposed road. It offers easy and fast construction as well as lower maintenance costs.

Structures over both north and south branches of Shadowbrook River

Similar structures will be built for both north and south branches of Shadowbrook River at the proposed locations. Small culverts are recommended which offers easy and fast construction as well as lower maintenance costs. Proposed structures have no known site constraints. Precast culverts will also minimise environmental impact. No geotechnical information is available for the proposed structure location. The information needs to be identified after the geotechnical investigation at preliminary design stage.

Structure over Church Lane

Two options were considered for this structure. The first option is to build a single span bridge structure over the Church Lane. The pad foundations and skeleton-column abutments will be built at either side of Church Lane. The bridge deck can be constructed offline and subsequently lifted into position. This option will minimum the disruption to travelling publics. The second option comprises a temporary diversion of Church Lane while constructing a buried box/overbridge structure. The type, dimensions and maintenance strategy for the proposed structure will be confirmed at Stage-3. No geotechnical information is available for the proposed structure location. The geotechnical information needs to be identified after the geotechnical investigation at preliminary design stage.

Maintenance access arrangements and/or provisions have yet to be agreed but would need to be discussed with all relevant parties to ensure the design incorporates maintenance requirements.

Geotechnical

The area of the new junction on the M42 will be located over areas of Alluvium which is likely to be weak and/or compressible.

Made ground associated with a historic landfill may underlie the tie in with the Clock Interchange and the link to the Clock Interchange passes through a small former landfill and where the route is in cutting. Should contaminated former landfill material be encountered and require removal to off-site landfill, additional disposal cost may be incurred.

The extent and nature of the Alluvium and Made Ground is not known and would be established during ground investigation along with the rest of the ground conditions. The presence of the Alluvium and Made Ground is a manageable risk.

Environment

There is risk that Option 2 will result in air quality, noise and visual impacts to sensitive receptors in Bickenhill and the wider area. Further survey and modelling work including the development of mitigation measures is required to resolve these impacts. These measures should also be designed to mitigate impacts to cultural heritage assets.

Option 2 severs the village of Bickenhill at Church Lane. Further mitigation design is required to prevent the option significantly impacting private dwellings and businesses through land take, severance and loss of amenity.

This option has potential physical impacts on Roadside Hedge EWS/Ecosite, Aspbury's Coppice Ancient Woodland / EWS and European Protected Species. Further survey and assessment work is required to catergorise the importance of the EWSs and confirm the presence of these species or the habitat for other species, to determine likely impacts and to develop suitable mitigation measures.

It is anticipated that suitable drainage and flood compensation will be designed during PCF Stages 2 and 3 to avoid impacts to the water environment.

Risks/Hazards

- Departures from standard required which need to be submitted to Highways England and SMBC
- Airport Exit to new roundabout may not work
- Existing structures to be demolished and/or replaced at Solihull Road
- Local road networks will be impacted by the proposals the extent of which is still to be determined via traffic modelling.
- Impact to flood zones 2 and 3.
- Ancient Woodland impacted by scheme.
- Proposals over areas of soft ground, made ground and landfill which needs to be confirmed via ground investigations
- Potential diversion works for 132kV pylons as well as aqueduct
- Note – at this time impact to existing PRoWs and National Trail have not been determined. The provision of link connecting to Airport free flow would block the existing footway/cycleway along the existing flyover. Details of the alternative arrangement may require an additional underpass structure.

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Project:	M42 Junction 6 Improvement Scheme	**Date:**	23/06/17
		TN Ref:	0055
Subject:	Option 3		
Author:	Darren Morris/Oleg Makarov	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0055
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		Revision:	P01

Introduction

The proposed improvement scheme is required to alleviate the current congestion and journey reliability issues associated with the M42 Junction 6. The junction lies at the heart of an area of dynamic growth, and is a gateway to Birmingham Airport, the National Exhibition Centre (NEC) and Birmingham Business Park. In addition, a station for the proposed High Speed Two (HS2) is to be located nearby and the plans for Solihull MBC's UK Central (UKC) mixed use development will continue to add significant demand to the network and increase dependence on M42 Junction 6. Other key stakeholders within close proximity to the scheme and Strategic Road Network (SRN) include the National Motorcycle Museum (NMM), Jaguar Land Rover (JLR) and Solihull Metropolitan Borough Council (SMBC). A new Motorway Service Area (MSA) is proposed south of the existing junction 6 - this proposal has been submitted for planning approval but no formal decision has to date been made.

Description of Proposals

Option 3 as shown on drawing HE551485-MOU-GEN-M42_J6-DR-CH-0001 provides an additional diverge and merge from/to M42, located to the south of the existing junction 6 south-facing slip roads with the links then connecting to Clock Interchange and Airport Way via the proposed Bickenhill Roundabout.

Option 3 precludes development of MSA south of the existing junction 6.

Option 3 is more visually intrusive than both Options 1 & 2 due to the high embankment over the M42 – southbound merge link. In addition it also passes underneath Church Lane similar to Option 2 where it splits Bickenhill village.

Design Standards

- **TD9/93 – Highway Link Design**
- **TD16/07 – Geometric Design of Roundabouts**
- **TD22/06 – Layout of Grade Separated Junctions**
- **TD27/05 – Cross-sections and Headrooms**
- **TD39/94 – The Design of Major Interchanges**

Geometry

Design Speed

- Slip roads – amendments to junction 6 slip roads for a 70kph design speed, unless the slip road is longer than 0.75km then it will be 85kph
- New southern junction links – designed as interchange links to an 85kph design speed

- Catherine de Barnes re-alignment – 70kph as existing in signed as 40mph prior to the St Peters Lane junction
- Dumb-bell Link and Airport Way Link – designed to a 70kph design speed
- Segregated/Free flow left turns – design to a 70kph design speed

Alignment

Slip road layouts

The proposed diverge and merge which forms a New Southern Junction the slip road layouts are considered an under-provision as the mainline traffic flows require five lanes and this scheme is not a widening scheme. The slip road layouts for both merge and diverge are to be designed as ghost island merge and diverge respectively. It is envisaged the existing south facing slips at M42 J6 will be retained.

Interchange links

The design speed of the interchange links are based on TD 22/06 and will have an 85kph design speed. The location of the interchange links has been based on the requirement for successive diverge and merges and the alignment to facilitate a safe connection to Clock Interchange.

The interchange links merge diverge layouts are considered an under provision as the mainline requires five lanes upstream of the south facing links and only the existing four lanes are being maintained. A departure from standard has been highlighted with Highways England's Safety, Engineering and Standards division and included in the DfS Checklist.

The alignment of the link is compliant for a 85kph design speed, except in one location, a 255m radius is proposed for the southbound merge which is coincident with a reduce vertical alignment K of 30 (desirable minimum K=55), this has been included to minimise the impact at Church Lane where the alignment crosses the existing local road is a similar location to Option 2.

Proposed Interchange links are proposed to be designed as II2A – 2 lane with hardstrip links.

Proposed Bickenhill Roundabout

It is not possible to connect the proposed Interchange Links directly with Clock Interchange. Because of the approach angle it is necessary to introduce a roundabout to enable a sharp change in the alignment curvature. It is also necessary to introduce the proposed roundabout in order to provide access to Catherine de Barnes Lane. The size of the roundabout will be based on traffic modelling and alignment design to provide a safe and efficient layout, it is currently shown with a 100m inscribed circular diameter.

Dumb-bell Link

A dumb-bell link connection between existing Clock Interchange and the new Bickenhill Roundabout will be a dual link, with the exit from the new roundabout with an additional lane which drops to Airport Way. The southbound visibility on the link will be restricted by the existing structure to a minimum of 35m - in order to improve this an alteration to the existing flyover structure will be required. The lane drop to Airport Way in northbound direction situated 80m from the roundabout exit. This is a substantial reduction to the 262m weaving distance requirements for 70kph design speed. In order to provide a sufficient manoeuvring distance the lane designation has to be introduced within the Interchange Link approach to the proposed Bickenhill roundabout – the offside lane should be marked with Clock Junction designation and the nearside lane should be marked designated to Airport and Bickenhill. A similar lane dedication would be required on the proposed Catherine de Barnes Lane approach.

The connecting link from the Bickenhill Roundabout to the Airport free flow link requires a 127m left hand bend radius in order to provide sharp change in direction. Vertical alignment of this link is determined by extensions of the cross fall from the dumb-bell link and the Airport free flow link. Connection with the existing flyover can be achieved as a taper merge prior to the existing A45 viaduct, but a safer way would be to reduce the existing flyover dual link to a single lane link to enable the proposed link from the Bickenhill roundabout to be a lane gain.

Local Roads

Catherine de Barnes Lane is re-aligned to connect to the new Bickenhill Roundabout. The alignment of this link is based on a 70kph design speed with horizontal radii ranging from 127m to 720m. The severance of the existing St Peters Lane junction will most likely require the introduction of a small roundabout to connect Clock Lane to Catherine de Barnes Lane.

Free flow lefts at J6

Refer to design narrative for Option 11A - HE551485-MOU-GEN-M42_J6-FN-CH-0057.

Non-standard Impacts

Refer to DfS checklist HE551485-MOU-GEN-M42_J6-DF-CH-0001_P02.

Stakeholders

- NEC – existing access and egress is retained to the circulatory carriageway, however, the free flow link is proposed to be constructed underneath the existing access, this will require reduced access provision during the construction phase;
- NMM – existing access and egress is retained to the circulatory carriageway, however, the proposals are similar to the NEC and the similar restrictions to access is expected, consideration has been given to provide a second exit point to the rear of the NMM via East Way/Stonebridge Island
- Birmingham Airport – should benefit due to improved capacity at J6 especially for vehicles travelling from the north, vehicles from the south have a link via a new roundabout to East Way
- UK Central – link proposed from existing East Way loop into UKC, general capacity improvements at Junction 6 due to free flow turns
- HS2 – similar to Birmingham Airport and UKC, should benefit due to capacity improvements and free flow left from M42 S to A45 E
- Villages – Bickenhill severely impacted due to the presence of the new southern access and egress points, will also require amendments to Church Lane over the proposed links as well as revisions to the St Peters Lane Junction with Catherine de Barnes. A number of properties are directly impacted with others indirectly.
- Statutory Undertakers Apparatus – this option would impact 132kv and potentially the 400kv overheads and associated pylons, it is likely the aqueduct of Severn Trent Water would also be impacted at a number of locations.
- Network Rail – it is envisaged that the existing structure will remain unaffected by these proposals
- Motorway Service Area (MSA) – is this option the MSA doesn't exist
- SMBC – connection to Clock Interchange and amendments to Catherine de Barnes Lane and local roads within Bickenhill. Consideration needs to be given regarding increasing the size of the existing Clock Interchange roundabout.

Traffic

The table below presents a summary of the emerging 2041 traffic results and the impact on the New Southern Junction in particular the slip road layouts and number of lanes on the mainline:

New Southern Junction Northbound Diverge	Traffic Flows		Slip Road Layout as per TD 22 Figure 2/5 MW	Number of Lanes Required as per TD 22 Figure 2/5 MW	
	Mainline	Slips		Upstream	Downstream
AM Peak	5971	2807	D	5	4
Inter Peak	5142	924	C	4	3
PM Peak	5789	1528	D	5	4
New Southern Junction Southbound Merge	**Traffic Flows**		**Slip Road Layout as per TD 22 Figure 2/3 MW**	**Number of Lanes Required as per TD 22 Figure 2/3 MW**	
	Mainline	**Slips**		**Upstream**	**Downstream**
AM Peak	6294	1140	E	4	5
Inter Peak	5077	950	E	3	4
PM Peak	5739	643	A or D	4	4

As can be seen from the table above and as mentioned earlier the mainline requires five lanes upstream of the diverge and downstream of the merge.

Structures

There are 2no. existing bridge structures (one belongs to Solihull Metropolitan Borough Council) and 3no. major retaining wall structures and 1no. culvert structure that will be affected by this option.

The Shirley Fields Accommodation Bridge and Outfall No.19 Culvert will be modified to accommodate the proposed road layout. It is envisaged that the work will potentially cause the disruption to the road network in the form of the complete/partial road closure. The Shirley Fields Accommodation Bridge may require to be closed during the work. Alternatively, a new bridge can be built offline and set parallel to the existing bridge. Once the new bridge constructed, the existing bridge can be demolished. The existing culvert may need to be lengthened if the new alignment does not tie into the proposed road alignment.

The Inbound Access Catherine De Barnes OB between the Clock Interchange and the New Bickenhill Roundabout will need to be assessed to confirm whether the existing structure meets the future traffic requirements for suggested option. If the structure does not meet the design traffic requirements for the option, a new bridge option is likely to be considered. The proposed new bridge could comprise of the single or multi-span structure. Material and form of the

structure will be determined at the stage-3 preliminary design stage. Appropriate traffic management measures shall be required during refurbishment/replacement of the bridge structure.
Smart Motorway gantries and small retaining walls will be affected in the location of Option 2P and will need to be modified to suit the new road layout. It should be noted that the widening of existing structures will also influence the existing pylon locations – resulting in possible pylons relocation. The dimensions and types of the proposed structures will be confirmed at later stage.

In order to form the design layout, two new structures are also required:

Under/over M42 structures
Two options were considered for this structure. The first option is to lengthen the existing culvert (Outfall No.19) at either side of the M42 and construct a new bridge over Shadow Brook stream. This option will require temporary traffic management of the M42 during the construction of culvert extensions. It should be noted that the presence of 400kV overhead power lines to the east and 132kV power lines to the west of the M42 will limited the construct location and height of the new bridge. The alternative option is to construct a multi-span bridge over both Shadow Brook stream and the M42. However, the vertical clearance between the M42 and the overbridge may be restricted by the presence of the aforementioned overhead power lines which may require relocating. The material, type of structure, dimensions, and maintenance strategy for the proposed structure will be confirmed at Stage-3. The approximate ground conditions for proposed bridge structure can be obtained from GI report for Shirley Fields Accommodation Bridge. However, the exact ground condition should be confirmed once the location of the structure is finalised.

Church Lane Bridge
Two options were considered for this structure. The first option is to build a single span bridge structure over the Church Lane. The abutments will be built at the proposed location on either side of Church Lane and the bridge deck can be constructed offline and subsequently lifted into position. This option will cause minimum disruption to the traffic. The second option comprises a temporary diversion of Church Lane while constructing a buried box/bridge structure at the proposed location. The material, type of structure, dimensions and maintenance strategy for the proposed structure will be confirmed at Stage-3. No geotechnical information is available for the proposed structure location. The geotechnical information needs to be identified after the geotechnical investigation at preliminary design stage.

Geotechnical
A small section of the link roads to the A45, where the earthworks are likely to be at their highest, will be located over areas of Alluvium which is likely to be weak and/or compressible. Some sections of the proposed new free flow links around Junction 6 impinge onto areas of Made Ground associated with the construction of the NEC and the M42.

The extent and nature of the Alluvium and Made Ground is not known and would be established during ground investigation along with the rest of the ground conditions. The presence of the Alluvium and Made Ground is a manageable risk.

Environment
There is risk that Option 2P will result in air quality, noise and visual impacts to sensitive receptors in Bickenhill and the wider area. Further survey and modelling work including the development of mitigation measures is required to resolve this. These measures should also be designed to mitigate impacts to cultural heritage assets. Option 2P severs the village of Bickenhill at Church Lane. Further mitigation design is required to prevent the option significantly impacting private dwellings and businesses through land take, severance and loss of amenity.

This option has potential impacts on European Protected Species. Further survey and assessment work is required to confirm the presence of these species or habitat for other species, to determine likely impacts and develop suitable mitigation measures.

It is anticipated that suitable drainage and flood compensation will be designed during PCF Stages 2 and 3 to avoid impacts to the water environment.

Risks/Hazards

- Departures from standard required which need to be submitted to Highways England and SMBC
- Interchange Link, new roundabout and local road re-alignment within and adjacent to Bickenhill,
- Existing structures to be demolished and/or replaced – footbridge/accommodation bridge, depending on the length of the slips required Shadow Brook Lane may be impacted by proposals.
- Local road networks will be impacted by the proposals the extent of which is still to be determined via traffic modelling.
- Proposals over areas of soft ground, made ground and landfill mainly around junction 6.
- Impact to aqueduct, 132kV and 400kV pylons and lines. Plus a number of other apparatus around junction 6.
- Widening proposals and utilising/stitching to existing structures at junction 6 may not be feasible and will require removal and replacement of four major structures with extensive and complicated traffic management arrangements.
- Note – at this time impact to existing PRoWs and National Trail have not been determined. The provision of link connecting to Airport free flow would block the existing footway/cycleway along the existing flyover. Details of the alternative arrangement may require an additional underpass structure.

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Project:	M42 Junction 6 Improvement Scheme	**Date:**	15/05/17
		TN Ref:	0068
Subject:	Option 1 (Option 2R West) 2041 Emerging Traffic Flow Results - Impact on a New Southern Junction		
Author:	Darren Morris	**Project Ref:**	HE551485-MOU-GEN-M42_J6-FN-CH-0068
Reviewed:	Keith Lewis	**Date:**	08/06/17
Approved:	Graham MacNicol	**Date:**	12/06/17
Suitability:	Suitable for Information	**Status:**	S2
		Revision:	P01

Introduction

The following technical note has been prepared to review the impact of the emerging 2041 design year traffic flows on a New Southern Junction (NSJ) for the M42 Junction 6 Improvement Scheme. These are based on Option 1 [formerly Option 2R West] traffic results, as this option was the first to be run in the traffic models. These results will be used to assist with the recommendation of a preferred option. Throughout this technical note the option will be referred to as 'Option 1'.

A general arrangement drawing (Ref: HE551485-MOU-GEN-M42_J6-DR-CH-0004) of Option 1 is provided in Appendix A.

The emerging 2041 traffic flows data for Option 1 are shown on a traffic schematic drawing which is provided in Appendix B (Ref: HE551485-MOU-VTR-M42_J6-SK-CH-0008).

Traffic Results

Tables 1 and 2 below present the 2041 design year traffic flows for the NSJ with and without a Motorway Service Area (MSA). Highways England TAME have commissioned a 2041 run as this year is when HS2 Phase 2 is anticipated to be completed. The test is to review the impact on the strategic road network (SRN) and not the design year (2038).

The flow ranges are as follows:

- AM peak – 0800 to 0900
- Inter-Peak – Average hour between 0930 and 1530
- PM Peak – 1700 to 1800

New Southern Junction without MSA

The current layout proposed for the NSJ without an MSA, is shown in Figure 1 below:

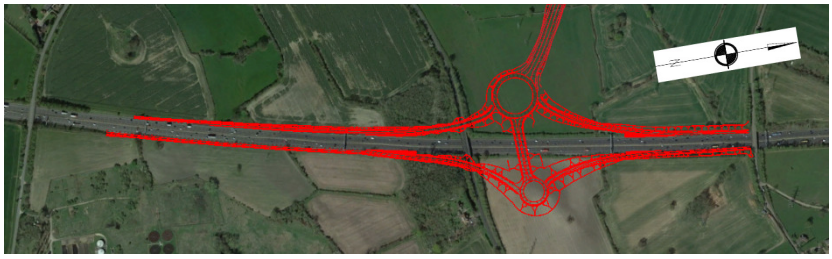


Figure 1: New Southern Junction without MSA (Google Earth+Option 1 KMZ)

This list below are design assumptions made for Option 1 regarding the slip road layouts at the NSJ. These were based on 2031 year traffic results, which originated from the initial 2031 PRISM tests to aid with sifting the options. The reason for the 2031 traffic flows was as a result of the delays to the regional PRISM model and as such an older version of PRISM was used.

1. Northbound diverge will be an under-provision as no widening of the M42 is included. The proposed slip road will be a Layout B Ghost Island diverge as shown in TD 22/06 Figure 2/6.1. The compliant layout is a Layout C Lane Drop Taper Diverge (five lanes upstream) as shown in TD 22/06 Figure 2/6.2.
2. Northbound merge will be a single lane slip road with a standard Layout A Taper Merge as shown in TD 22/06 Figure 2/4.2.
3. Southbound diverge will be a single lane slip road with a standard Layout A Taper Diverge as shown in TD 22/06 Figure 2/6.1.
4. Southbound merge will be an under-provision if the MSA traffic and no widening of the M42 are included, this is because the 2031 flows plus the MSA traffic will require five lanes. The proposed slip road will be a Layout C Ghost Island Merge as shown in TD 22/06 Figure 2/4.2, the compliant layout is a Layout E Lane Gain (five lanes downstream) as shown in TD 22/06 Figure 2/4.3.

Emerging 2041 Traffic Results for Option 1

Table 1 below presents a summary of the emerging 2041 traffic flow ranges for a NSJ (without an MSA). The table also identifies the appropriate TD 22/06 slip road layout(s) and number of traffic lanes required.

New Southern Junction Northbound Diverge	Traffic Flows (veh/hr)		Slip Road Layout as per TD 22 Figure 2/5 MW	Number of Lanes Required as per TD 22 Figure 2/5 MW	
	Mainline	Slips		Upstream	Downstream
AM Peak	6693	2016	D	5	4
Inter Peak	5263	750	C	4	3
PM Peak	6451	796	C	5	4
New Southern Junction Northbound Merge	Traffic Flows		Slip Road Layout as per TD 22 Figure 2/3 MW	Number of Lanes Required as per TD 22 Figure 2/3 MW	
	Mainline	Slips		Upstream	Downstream
AM Peak	6693	0	A or D	4	4
Inter Peak	5263	0	A or D	3	3
PM Peak	6451	0	A or D	4	4
New Southern Junction Southbound Diverge	Traffic Flows		Slip Road Layout as per TD 22 Figure 2/5 MW	Number of Lanes Required as per TD 22 Figure 2/5 MW	
	Mainline	Slips		Upstream	Downstream
AM Peak	6440	77	A	4	4
Inter Peak	5102	0	A	3	3
PM Peak	5827	333	A	4	4
New Southern Junction Southbound Merge	Traffic Flows		Slip Road Layout as per TD 22 Figure 2/3 MW	Number of Lanes Required as per TD 22 Figure 2/3 MW	
	Mainline	Slips		Upstream	Downstream
AM Peak	6440	926	E	4	5
Inter Peak	5102	853	E	3	4
PM Peak	5827	516	A or D	4	4

Table 1: New Southern Junction without MSA (2041 Traffic Flow Ranges)

Summary of Results

1. For the M42 mainline northbound between J5 and the NSJ, the 2041 flows suggest the need for five lanes on the mainline in the AM and PM peak
2. The northbound diverge for the NSJ requires a layout D, Ghost Island diverge for lane drop
3. Within the NSJ on the northbound carriageway, the AM and PM peak flows suggest the need for four lanes (i.e. through junction running)
4. The northbound diverge slip road will require two lanes in the AM and PM peaks – suggested cross section from TD 22/06 Chapter 3 Table 3/1b is DG2A – two lanes with hardstrip
5. A northbound merge is not required on the NSJ as the AM, PM and Inter-Peak has zero flow, note see Summary of Departures from Standard item 3(a) below.
6. Traffic flows in the AM and PM peak upstream of the northbound merge require four lanes
7. The NSJ southbound diverge – the traffic flows suggest the need for a slip road in the AM and PM peak only
8. The NSJ southbound diverge – require four lanes upstream and downstream of the diverge in the AM and PM peak.
9. The NSJ southbound diverge requires a Layout A, diverge taper (single lane)
10. The southbound diverge slip road will require one lane in the AM and PM peak – suggested cross section from TD 22/06 Chapter 3 Table 3/1b is DG1A – single lane with hard shoulder

11. Within the NSJ on the southbound carriageway, AM and PM peaks suggest four lanes (i.e. through junction running)
12. The NSJ southbound merge in the AM and Inter-peak requires a Layout E, lane gain.
13. In the AM peak the lane gain requires five lanes downstream of the merge
14. The southbound merge slip road will require one lane in all the peaks – suggested cross section from TD 22/06 Chapter 3 Table 3/b is MG1A – single lane with a hardshoulder

Summary of Departures from Standard

1. Under provision of slip road layout on northbound diverge
2. M42 northbound under provision of number of lanes on the mainline between M42 J5 and NSJ – four lanes provided, five required (note: need to review number of lanes for weaving)
3. Weaving lengths (L_{act}) northbound and southbound NSJ to J6
    a. Northbound (L_{act} = 1.175km) – no requirement for slip road merge as zero flow indicated – but resilience is lost if removed
    b. Southbound (L_{act} = 1.160km) - traffic flow (slip road flow in PM peak is 333vph) discussion to be held with Highways England's Safety, Engineering and Standards (SES) team with respect to an option with or without the MSA. As the 333vph doesn't include any MSA traffic and following discussions with Highways England in particular the SES team, one of the main reason the sub-standard weaving lengths had been approved were the low traffic flows.
4. Weaving length northbound J5 to NSJ is '**compliant'** from current design i.e. J5 as existing layout and new southern junction as a layout B – L_{act} is 2020m (a Departure has been included – as the current proposals are only an outline design and based on emerging traffic results not a final model so the slip road layouts are subject to change)
5. Under provision of slip road layout southbound merge as not a widening scheme so possible proposal for a layout C when a Layout E is required
6. M42 mainline southbound under provision of the number of lanes due to the requirement of five lanes. (Note: an assessment for the number of lanes for weaving needs to be undertaken).
7. Weaving length southbound NSJ to J5 included as slip road layout has not been subject to a preliminary design and may result in a minor shortfall in weaving length.
8. As this note is mainly related to traffic, it should be noted that another two departures are likely:
    a. Sub-standard SSD northbound diverge to minimise impact to ancient woodland area
    b. Sub-standard taper northbound merge (205m required provided 150m) to avoid Shadow Brook Lane Overbridge – note see item 3(a) above.

New Southern Junction with an MSA

The current layout proposed for the New Southern Junction with an MSA is shown in green in Figure 2 below:

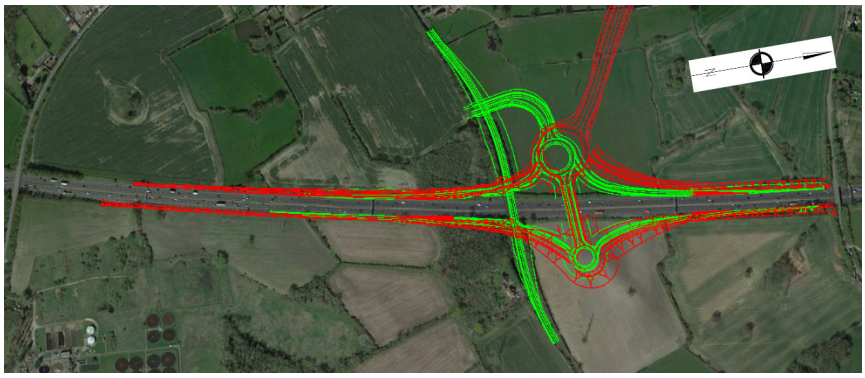


Figure 2: New Southern Junction with MSA (Google Earth+Option 1 KMZ+MSA KMZ)

The design assumptions for this proposal are as for Option 1 without MSA.

It should be noted from discussions with Highways England and their spatial planning consultants, the MSA developer only has to justify the MSA traffic information for its opening year. This is based on DfT Circular 02/2013, where developers are only required to mitigate their transport impacts in the opening year (in this case 2018). The principle was that Highways England accepts responsibility for long term implications of background/future traffic growth. An Additional principle was that the MSA is not a trip generator.

It is also worth referencing the Highways England document on '*Planning for the future. A guide to working with Highways England on planning matters*', regarding the MSA application dated September 2015. It states that traffic assessments should be carried out for:

1. the development and construction phase; and
2. the opening year, assuming full build out and occupation, and
3. either a date ten years after the date of registration of the associated planning application or the end of the Local Plan period (whichever is greater)

The assessment at opening will be used for the determination of impact mitigation needs whilst the latter is necessary to determine the risk which will transfer to Highways England.

Emerging 2041 Traffic Results for Option 1 with an Motorway Service Ares

Table 2 presents a summary of the traffic results on a NSJ with an MSA. Note the MSA flows in 2041 have been based on a 6% turn in rate as suggest in the MSA Transport Assessment which is located on the Solihull Metropolitan Borough Council (SMBC) planning portal, case reference – PL/2015/51409/PPOL.

Table 2 below has been based on Table 1 presented earlier in this note, with the mainline and slip road flow adjusted to reflect the turn in rate as quoted above. Consideration was given to simply adding the flow to the slip road only. However, this wouldn't accurately reflect the potential inclusion of an MSA when it isn't considered a traffic generator.

New Southern Junction Northbound Diverge	Traffic Flows (veh/hr)		Slip Road Layout as per TD 22 Figure 2/5 MW	Number of Lanes Required as per TD 22 Figure 2/5 MW	
	Mainline	Slips		Upstream	Downstream
AM Peak	6170x	2539	D	5	4
Inter Peak	4902x	1111	C	4	3
PM Peak	6016x	1231	C	5	4
New Southern Junction Northbound Merge	**Traffic Flows**		**Slip Road Layout as per TD 22 Figure 2/3 MW**	**Number of Lanes Required as per TD 22 Figure 2/3 MW**	
	Mainline	**Slips**		**Upstream**	**Downstream**
AM Peak	6170x	523	A or D	4	4
Inter Peak	4902x	361	A or D	3	3
PM Peak	6016x	435	A or D	4	4
New Southern Junction Southbound Diverge	**Traffic Flows**		**Slip Road Layout as per TD 22 Figure 2/5 MW**	**Number of Lanes Required as per TD 22 Figure 2/5 MW**	
	Mainline	**Slips**		**Upstream**	**Downstream**
AM Peak	6048x	469	A	4	4
Inter Peak	4796	306	A	3	3
PM Peak	5457x	703	A	4	4
New Southern Junction Southbound Merge	**Traffic Flows**		**Slip Road Layout as per TD 22 Figure 2/3 MW**	**Number of Lanes Required as per TD 22 Figure 2/3 MW**	
	Mainline	**Slips**		**Upstream**	**Downstream**
AM Peak	6048x	1318	E	4	5
Inter Peak	4796	1159	E	3	4
PM Peak	5457x	886	A or D	4	4
Note: MSA Traffic flows are assumed to be 6% turn in rate of the mainline flow upstream of the junction, these will be added to the 2041 Option 1 slip road flows and removed from the mainline flow within the junction. The mainline flow quoted in the tables above are flows 'within' the junction not upstream or downstream.					

Table 2: New Southern Junction with MSA (2041 Traffic Flow Ranges)

Summary of Results

1. For the M42 mainline northbound between J5 and NSJ the 2041 flows suggest the need for five lanes on the mainline in the AM and PM peak
2. The northbound diverge for the NSJ requires a layout D Ghost Island diverge for lane drop
3. Within the NSJ the AM and PM peaks suggest the need for four lanes (i.e. through junction running)
4. The northbound diverge slip road will require two lanes in the AM and PM peaks – suggested cross section from TD 22/06 Chapter 3 Table 3/1b is DG2A – two lanes with hardstrip
5. A northbound merge is required at the NSJ purely to cater for the MSA merge flow.
6. The flow on the mainline in AM and PM peak suggests the northbound merge will require a Layout A or D, taper merge or 2 lane urban merge respectively, requiring four lanes downstream of the merge.

7. The northbound merge slip road will require one lane – suggested cross section from TD 22/06 Chapter 3 Table 3/1b is MG1A – one lane with hardshoulder
8. Traffic flows in the AM and PM peak upstream of the northbound merge require four lanes
9. NSJ southbound diverge is required and in the AM and PM peak require a Layout A – standard taper
10. For the NSJ southbound diverge slip road will require one lane – suggested cross section from TD 22/06 Chapter 3 Table 3/1b is a DG1A - single lane with hard shoulder
11. NSJ southbound diverge – require four lanes upstream and downstream of the merge in the AM and PM peak
12. Within the NSJ the AM and PM peaks suggest four lanes (i.e. through junction running)
13. The NSJ southbound merge in the AM peak requires a Layout E Lane gain
14. The flow on the mainline in the AM peak requires five lanes downstream of the southbound merge
15. The southbound merge slip road will require one lane in the AM and PM peaks – suggested cross section from TD 22/06 Chapter 3 Table 3/b is MG1A – one lane with hardshoulder, however the AM Peak flow is close to the border with the requirement for two lanes (MG2C)

Summary of Departures from Standard

1. Under provision of slip road layout for northbound diverge
2. M42 northbound, under provision of number of lanes on the mainline between M42 J5 and New Southern Junction, four lanes provided, five required (note: need to review number of lanes for weaving)
3. Weaving lengths (L_{act}) northbound and southbound New Southern Junction to J6
    a. Northbound as per MSA submission (unless existing M42 J6 diverge is amended) - L_{act} 1.175km
    b. Southbound - L_{act} – 1.160km, traffic flow (Slip Road PM Peak) has increased compared to the MSA submission, need to raise with Highways England Safety, Engineering and Standards (SES).
4. Weaving length northbound J5 to NSJ is '**compliant'** from current design i.e. J5 as existing layout and new southern junction as a layout B – L_{act} is 2020m (a Departure has been included – as the current proposals are only an outline design and based on emerging traffic results not a final model so the slip road layouts are subject to change)
5. M42 southbound diverge – consideration may be needed to provide two lanes on the slip road, this is to be confirmed with the micro-simulation model, so included as a potential departure.
6. M42 southbound merge under provision as not a widening scheme as the mainline requires five lanes which is outside the scope of this project, so likely to propose a layout C where a Layout E is required
7. M42 mainline southbound under provision of the number of lanes due to the requirement of five lanes. (Note: an assessment for the number of lanes for weaving needs to be undertaken).
8. Weaving length southbound NSJ to J5 included as slip road layout has not been subject to a preliminary design and may result in a minor shortfall in weaving length.
9. For completeness (as this note is mainly related to traffic), two further departures are required:
    a. Sub-standard SSD northbound diverge to minimise impact to ancient woodland area
    b. Sub-standard taper northbound merge (205m required provided 150m) to avoid Shadow Brook Lane Overbridge

ARCADY Results

An ARCADY assessment was carried out on the NSJ proposed western and eastern roundabouts of the dumb-bell junction. They have been assessed with and without the MSA to review the capacity at 2041. The results are presented below. The roundabout designs are outline only and are subject to further alterations. The geometric parameters used are based on the likely values at preliminary design.

An important result is the ratio of the flow to capacity (RFC), which is defined in **TA 23/81 Junctions and Accesses : Determination of Size of Roundabouts and Major / Minor Junctions** :- Clause 6.2 states "…The

general use of designs with an RFC ratio of about 85% is likely to result in a level of provision which will be economically justified …".

The level of service (LOS) is a qualitative measure used to relate the quality of traffic service. LOS is used to analyse highways by categorising traffic flow and assigning quality levels of traffic based on performance measure like speed, density, etc. The LOS is ranked A through to F, A being the best and F the worst, summarised below:

- LOS A – free flow
- LOS B – reasonably free flow
- LOS C – stable flow, at or near free flow
- LOS D – approaching unstable flow
- LOS E – unstable flow, operating at capacity
- LOS F – forced or breakdown of flow

The ARCADY results are included in Appendix C of this technical note, with the results summarised below.

New Southern Junction without MSA

Table 3 presents the ARCADY summary results for the junction without an MSA.

	AM Peak Hour				PM Peak Hour			
Roundabout Location	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**
Dumb-bell junction West – Link Bridge	0.03	1.17	0.02	A	0.13	1.27	0.11	A
Dumb-bell junction West – M42 Northbound Diverge	1.91	3.11	0.64	A	0.42	1.74	0.28	A
Dumb-bell junction West – Dual Link	0.45	1.58	0.29	A	0.21	1.33	0.16	A
Dumb-bell junction East – M42 Southbound Diverge	0.10	4.12	0.08	A	0.35	3.44	0.23	A
Dumb-bell junction East – Link Bridge	0.48	1.69	0.3	A	0.22	1.42	0.17	A

Table 3: ARCADY Results 2041 New Southern Junction without an MSA

Summary of Results

1. All RFC values are considerably below the recommended 0.85.
2. The current outline design for the New Southern Junction has the potential to reduce in size. It is recommended that this be investigated further at Stage 3.
3. All LOS rankings are **A,** which means the junction operates in a free-flow state.

New Southern Junction with MSA

Table 4 below presents the ARCADY summary results for the junction an MSA.

	AM Peak Hour				PM Peak Hour			
Roundabout Location	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**	**Queue (PCU)**	**Delay (s)**	**RFC**	**LOS**
Dumb-bell junction West – Link Bridge	0.24	1.54	0.17	A	0.39	1.66	0.25	A
Dumb-bell junction West – M42 Northbound Diverge	22.39	31.61	0.97	D	1..39	3.77	0.56	A
Dumb-bell junction West – MSA	236.59	780.42	1.76	F	1.65	5.36	0.59	A
Dumb-bell junction West – Dual Link	0.70	3.26	0.39	A	0.41	2.31	0.28	A
Dumb-bell junction East – M42 Southbound Diverge	2.58	16.71	0.70	C	3.97	17.47	0.78	C
Dumb-bell junction East – Link Bridge	0.72	1.95	0.39	A	0.50	1.71	0.31	A

Table 4: ARCADY Results 2041 New Southern Junction with an MSA

Summary of Results

1. There are two situations where the roundabout RFC values are greater than the recommended 0.85, these are:
   - Dumb-bell Junction West M42 Northbound Diverge – AM Peak – RFC 0.97
   - Dumb-bell Junction West MSA Access – AM Peak – RFC 1.76

2. The LOS rankings for the two situations identified at (1) are **D** and **F** respectively, which indicates flow breakdown, and in the case of LOS **F** is likely to result in traffic jams.

The RFC value for the West Roundabout MSA Access – AM peak of 1.76 and M42 Northbound Diverge – AM peak of 0.97, indicate there would be queuing on the approaches and incur delays.

It is recommended that these results be re-assessed and ARCADY re-run, once the micro-simulation model is complete, as the flows may alter. If the traffic flows are similar in the micro-simulation the following actions are recommended for MSA Access to circulatory and M42 Northbound diverge onto circulatory:

Design Implications of ARCADY results

1. MSA Access to circulatory

1. Do nothing and discuss the results with the MSA developer
2. Consider a three lane entry (note: the roundabout is already at the maximum recommend ICD of 100m (TD16/07 paragraph 7.3), so careful consideration is to be given not to impact other approach arms and exits).
3. Consider traffic signal control of the whole or part of the roundabout

2. M42 Northbound Diverge onto circulatory

1. Increase the slip road provision to allow three lanes at entry alternatively;
2. Consider provision of a segregated left turn lane into the MSA – (RFC values for this arm would be similar to the ARCADY without an MSA – in Table 3, RFC = 0.64)
3. Consider traffic signal control of the whole or part of the roundabout

The M42 northbound diverge would have priority over the MSA access and will still operate in 2041. The main delays are for MSA users waiting to enter the western dumb-bell roundabout to access the SRN.

Conclusions

The results of the ARCADY assessment show that in 2041 without the MSA, the New Southern Junction would have sufficient capacity to cope with the forecasted flows.

When considering the inclusion of an MSA at the New Southern Junction, or if in fact the MSA will be in place prior to M42 Junction 6 Improvement Scheme being constructed. This requires further discussion with the MSA developer given the potential increase in infrastructure such as additional entry lanes as referenced in the Design Implications section above, due RFC values. However, the geometric requirements need to be confirmed at preliminary design and will need to be reviewed against the traffic flows subject to the completion of the micro-simulation model.

It should be borne in mind that the MSA developer only needs to justify their proposals to opening year (currently 2018). The principle being that Highways England accepts responsibility for long term implications of background traffic growth. An additional principle was that the MSA is not a trip generator.

Impact on Statutory and Non-Statutory Sites

Feature	Likely Impacts	Option
River Blythe SSSI	This site, at its closest point, lies 450m from the nearest Option. However, there are potential impact pathways such as Hollywell Brook LWS, Shadow Brook and an unnamed watercourse all which flow into the River Blythe SSSI. The proposed options could all result in adverse impacts, without appropriate mitigation, given the importance and the sensitivity of the designating features in relation to indirect impacts during construction and operation (pollution and road run-off) and direct in-channel works.	All
Bickenhill Meadows SSSI	This site may receive direct adverse impacts due to loss and/or modification of habitat as a result of one variation of route option 1, although Option 1B is not anticipated to have any direct impact on the site. This site may also receive indirect impacts from nitrogen deposition as a result of the proximity of the new road options. The magnitude of impact is unknown at this stage. Further work is required to categorise the importance of these sites to determine the significance of effects on air quality on these habitats.	Direct: 1 Indirect: All
Coleshill and Bannerly Pools SSSI Bickenhill Churchyard Ecosite	These sites may receive indirect impacts from nitrogen deposition as a result of the proximity of the new road options. The magnitude of impact is unknown at this stage. Further work is required to categorise the importance of these sites to determine the significance of effects on air quality on these habitats.	All
done	This site may receive direct adverse impacts due to loss and/or modification of habitats during both construction and operational phases which, in turn, may impact on other ecological receptors. The proposed options could all result in adverse impacts, in the absence of mitigation, given its importance in relation to the local area and sensitivity of potential receptors.	All
Main Birmingham to London Railway Line Ecosite	This site may receive direct adverse impacts due to habitat loss and/or degradation as a result of all options.	All
Castle Hill Farm Meadows LWS Clock Lane Meadows Ecosite Meadows to the east of the Jungle Ecosite	These sites may receive indirect impacts from nitrogen deposition as a result of the proximity of all route options. The magnitude of impact is unknown at this stage. Further work is required to categorise the importance of these sites to determine the significance of effects on air quality on this habitats.	Direct: 1 Indirect: All
Permanent habitat loss and/or modification; UK BAP habitats	These BAP habitats are important at a local level therefore it is anticipated that construction of the proposed options could potentially result in adverse impacts in the absence of mitigation. This is due to permanent modification of the land required for all options and habitat severance during construction.	All
Bats	Bats may receive adverse impacts due to removal of roost sites, and removal of commuting and foraging habitat associated with all route options. Increased artificial lighting, vibration and noise associated with construction could also result in adverse effects by disturbing roost sites or commuting habitat, such as linear features and watercourses. The magnitude of impact is unknown at this stage. Further survey work is required to categorise the importance of bats and determine the significance of effects to these species.	All
Great crested newts and other amphibians	Great crested newts could be present within ponds and terrestrial habitats located within the survey area and could receive adverse effects from development by habitat loss or modification or	All

Feature	Likely Impacts	Option
	increased habitat severance associated with all route options. The magnitude of impact is unknown at this stage. Further survey work is required to categorise the importance of great crested newts and determine the significance of effects to these species.	
Otter/Water vole	There is a potential for all proposed options to result in adverse impacts to otter and water vole due to habitat loss and/or modification, disturbance during construction and from increased run-off to aquatic habitats. The magnitude of impact is unknown at this stage. Further survey work is required to categorise the importance of otter and water vole and determine the significance of effects to these species.	All
White-clawed crayfish	There is a potential for all proposed options to result in adverse impacts to white-clawed crayfish due to habitat destruction during in-channel works and from increased run-off to aquatic habitats (see Chapter 13 Road Drainage and the Water Environment). The magnitude of impact is unknown at this stage. Further survey work is required to categorise the importance of white-clawed crayfish and determine the significance of effects to these species.	All
Fish	There is a potential for all proposed options to result in adverse impacts to Worcestershire BAP fish species due to habitat destruction during in-channel works and from increased run-off to aquatic habitats (see Chapter 13 Road Drainage and the Water Environment). The magnitude of impact is unknown at this stage. Further survey work is required to categorise the importance of fish and determine the significance of effects to these species.	All
Dormice	There is a potential for all proposed options to result in adverse impacts to dormice due to disturbance during construction and from habitat loss. The magnitude of impact is unknown at this stage. Further survey work is required to categorise the importance of dormice, and determine the significance of effects to this species.	All
Reptiles	There is a potential for all proposed options to result in adverse impacts to reptiles due to disturbance, death or injury during construction and from habitat loss and severance. The magnitude of impact is unknown at this stage. Further survey work is required to categorise the importance of reptiles, and determine the significance of effects to these species.	All
Birds	There is a potential for all proposed options to result in adverse impacts to breeding birds, in the absence of mitigation. If trees, woodland, hedgerows or other woody vegetation are to be removed there is risk of killing or injuring breeding birds and / or their young and nests as well as the loss of suitable nesting habitat.	All
Hedgehog	There is a potential for all proposed options to result in adverse impacts to hedgehogs due to habitat loss and increased severance and increased risk of road strikes In the absence of mitigation, the proposed options are likely to result in adverse impacts to hedgehogs.	All
Invertebrates	There is a potential for all proposed options to result in adverse impacts on rare and endangered invertebrates due to habitat loss and degradation. The magnitude of impact is unknown at this stage. Further survey work is required to categorise the importance of invertebrates, and determine the significance of effects to these species.	All
Badger	[redacted]	All

Feature	Likely Impacts	Option
Aspbury's Copse Ancient Woodland/LWS/Ecosite	This site may receive direct adverse impacts due to habitat loss and/or degradation associated with Options 1 and 2. This site may also receive indirect impacts from nitrogen deposition as a result of the proximity of these options. The magnitude of impact is unknown at this stage. Further work is required to categorise the importance of this site to determine the significance of effects on air quality on this habitats.	1, 2
Roadside Hedge LWS/Ecosite	This site may receive direct adverse impacts due to habitat loss and/or degradation as a result of Option 2. This site may also receive indirect impacts from nitrogen deposition as a result of the proximity of Option 2. The magnitude of impact is unknown at this stage. Further work is required to categorise the importance of this site to determine the significance of effects on air quality on this habitats.	2
Wayside Cottages Meadows LWS/Ecosite Greens Ward Piece LWS/Ecosite	These sites may also receive indirect impacts from nitrogen deposition as a result of the proximity of Option 2 and 3. The magnitude of impact is unknown at this stage. Further work is required to categorise the importance of these sites to determine the significance of effects on air quality on this habitats.	2, 3
Japanese Knotweed	The route of Option 1 lies in close proximity to Japanese knotweed, a non-native invasive species, and may risk its spread.	1

Appendix G – Appraisal Summary Table

Appraisal Summary Table

Date produced:	26/05/2017

Contact:	
Name	S Bourne
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	M42 Junction 6 Improvements - Option 1
Description of scheme:	Option 1 provides an all movement junction to the south of Junction 6, will connect with the A45 at Clock Interchange. An additional free flow link will be provided, connecting the link road to the existing A45 westbound airport free flow link, avoiding Clock Interchange for northbound vehicles. North facing slip roads will be provided to connect Catherine de Barnes Lane and Bickenhill village to the Clock Interchange. A northbound connection from Catherine de Barnes Lane to the northbound link road will also be provided.

Impacts		Summary of key impacts	Assessment					
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	There is an overall improvement in the transport economic efficiency of business users as a result of the scheme, principally in the form of savings in journey time. 38% (£124.5m) of total TEE benefit during normal operation (£322.2m) is attributable to to changes in business journey times and vehicle operating costs.	Value of journey time changes(£): 115.76m Net journey time changes (£) 0 to 2min: 15.67m; 2 to 5min: 55.18m; > 5min: 44.91m				£124.5m	
	Reliability impact on Business users	The M42 and J6 in particular, currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. The Option 1 scheme includes a new link between the M42 and the Clock roundabout that provides a bypass to Junction 6 for trips to the airport, Birmingham Business Park and A45W (including JLR). The link provides a step change in network resilience to incidents and congestion at Junction 6, providing business users with associated reliability benefits. Business users such as JLR who use 'just in time' deliveries for production, rely on high levels of network reliability that the schem is aimed to deliver. Following completion of the operational traffic model, an assessment of reliability will be undertaken using the approach defined in TAG for urban roads.	The quantified reliability assessment is currently not available.			Moderate Beneficial		
	Regeneration	North Solihull is the subject of one of the largest regeneration programmes in England. In addition, there are pockets of deprivation in the Mature Suburbs and Rural Area with low incomes, unemployment and poor health in parts of Bickenhill, Elmdon, Lyndon, Olton and Shirley. The scheme is located at the heart of an area that is the planned focus of significant investment in development and associated infrastructure. Accordingly, there is a significant potential for spin-off benefits to the surrounding area, particularly through improved accessibility to employment opportunities afforded by the scheme.	In line with emerging TAG advice, regeneration is assessed as part of the wider economic impact assessment.				£74.6m	
	Wider Impacts	In line with guidance, an assessment covering the output change in imperfectly competitive markets, the tax revenues arising from changes in labour supply, agglomeration and the tax revenues arising from the move to more or less productive jobs has been undertaken using a WITA-compatible tool. The significant travel time benefits assessed to result from Option 1 directly give rise to improvements in accessibility that, in turn, are forecast to deliver £75m net benefits.	The WITA assessment identified a total potential wider benefit of £248m, of which 30% (£75m) has been assumed to be derived from the highway improvement afforded by the scheme.					
Environmental	Noise	Option 1 has the potential to increase noise levels to sensitive receptors on the altered roads, the introduction of the new junction, M42 slip roads and link to Airport Way. The new link has the potential to introduce a closer road traffic noise source to some noise sensitive receptors, particularly on the western side of Bickenhill and to a lesser extent to the northeast side of Catherine de Barnes. Within 1km of the corridor there are four Defra Noise Important Areas (NIAs): • on the A45 at Elmdon, (reference number 2830); • on the A45 West of Junction 6, (ref no 2831); • on the M42 South of Junction 6 (ref no 7481); and • on the West of the M42 further south between Junction 5 and Junction 6 (ref no 7482).	There are 207 dwellings and 10 other noise sensitive receptors within 600 m of the scheme corridor.				Not Calculated	
	Air Quality	Option 1 has the potential to impact local air quality at sensitive receptors in proximity to the Clock Interchange and Catherine De Barnes Lane (B4438), including residential dwellings adjacent to Clock Lane in proximity to the Clock Interchange. With the introduction of a new road source there is also the potential for the pathway distance of vehicular exhaust emissions between sensitive receptors, located along Catherine De Barnes Lane and Clock Lane, to decrease in comparison to the existing road configuration. Option 1 may require signalling changes and therefore there is potential for changes to the average and peak speeds of road traffic, which could impact local air quality. No widening of the mainline will be required, other than the provision of merge/diverge from free flow links, and no additional off-line roads will be constructed at Junction 6. Birmingham and Coleshill Air Quality Management Areas (AQMAs) are situated approximately 2.2km from the proposed option. One Pollutant Climate Mapping (PCM) model link (A45) is within 200m of the proposed option.	The approximate number of receptors considered sensitive to changes in air quality are given below: 0m-50m = 14 receptors 50m-100m = 13 receptors 100m-200m = 39 receptors Total = 66 receptors				Not Calculated	
	Greenhouse gases	Alleviation of road traffic congestion as a result of the implementation of Option 1 has the potential to reduce Greenhouse Gas emissions. However, any increase in road traffic flows might negate potential benefits. Confirmation of changes to traffic flows and speeds along the affected road links requires further quantitative assessment.				Not Calculated	Not Calculated	
	Landscape	Overall, the elements of this option would combine to noticeably increase the footprint and presence of the M42 and the surrounding highways network in the local and wider landscape of the study area. Option 1 would result in the permanent loss of existing: • woodland, within and beyond the highways boundary (including Ancient Woodland); • fragmentation of field patterns around the new link road; • alterations to the existing landform; • increased traffic movements; and, • lighting within the landscape.	Not Calculated			Moderate Adverse	n/a	
	Townscape	n/a	n/a			n/a	n/a	
	Historic Environment	One Conservation Area and 20 non-designated heritage assets will be directly impacted by Option 1. The assets consist of a mixture of sites dating from the Bronze Age to the Medieval and Post Medieval periods. The setting of 1 scheduled monument and 12 listed buildings will also be impacted upon.	Total number of known heritage assets affected is at least 33.			Moderate Adverse		
	Biodiversity	Option 1 will likely result in a major adverse impact on Bickenhill Meadows Site of Special Scientific Interest (SSSI), moderate adverse impact on Aspbury's Copse Ancient Woodland/Local Wildlife Site (LWS)/Ecosite (ES) and slight adverse impact on Castle Hill Farm Meadows LWS, Clock Lane Meadows ES and Main Birmingham to London Railway Line ES due to direct land-take. The option will also result in slight adverse impacts to Hollywell Brook LWS due to in-stream works and culvert extension. This option will also likely impact Coleshill and Bannerly Pools SSSI, Bickenhill Meadows SSSI, Castle Hill Farm Meadows LWS, Green Wards Piece LWS/ES, Bickenhill Churchyard ES, Clock Lane Meadows ES and Meadows to the East of the Jungle ES due to increased nitrogen deposition, but the magnitude of this impact is currently unknown. Option 1 will result in the loss of UK and Local Biodiversity Action Plan (BAP) habitats, resulting in a neutral-slight adverse impact. Replacement hedgerows may provide an improvement in habitat quality and result in a neutral-positive impact. This option will also likely impact on protected and notable fauna, if present. Impacts are currently unknown but are likely to be neutral-slight adverse.	Not Calculated			Major Adverse	Not Calculated	
	Water Environment	Surface water features in the area comprise of the Hollywell Brook, unnamed tributary of Shadow Brook, Shadow Brook, Blythe from Temple Balsall Brook to Patrick Bridge, Blythe river from Patrick Bridge to River Tame, unnamed tributaries of the Low Brook. One groundwater body is assessed (Tame Anker Mease Secondary Combined). A number of standing waterbodies were assessed, including Pendingo Lake and other unnamed ponds. A number of surface and groundwater abstractions are located in the study area. The construction and operation of the M42 J6 Option 1 is likely to have a Moderate Adverse impact upon the surrounding water environment, with the highest risk being increased flood risk. Effects on surface watercourses from potential pollution from routine run-off/accidental spillage with two new outfalls to surface watercourses are proposed with slight adverse impacts predicted. Option 1 features a larger impermeable surface area, five new culverts and changes to flow downstream as a result of cut-off drains on two ditches. In relation to groundwater, there is also a Slight Adverse impact on the potential indirect loss of Groundwater Dependent Terrestrial Ecosystems (located within 250m and a result of greater lengths of cutting with the potential to impact groundwater quality and flow. The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.	n/a			Moderate Adverse	n/a	
Social	Commuting and Other users	There is an overall improvement in the transport economic efficiency of commuting and other users as a result of the scheme, principally in the form of savings in journey time. 61% (£197.6m) of total TEE benefit during normal operation (£322.2m) is attributable to to changes in non-business journey times and vehicle operating costs.	Value of journey time changes(£): 195.61m Net journey time changes (£) 0 to 2min: 54.74m; 2 to 5min: 78.18m; > 5min: 62.69m				£197.64m	
	Reliability impact on Commuting and Other users	The M42 and J6 in particular, currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. The Option 1 scheme includes a new link between the M42 and the Clock roundabout that provides a bypass to Junction 6 for trips to the airport, Birmingham Business Park and A45W (including JLR). The link provides a step change in network resilience to incidents and congestion at Junction 6, providing commuters and air passengers in particular with associated reliability benefits. Following completion of the operational traffic model, an assessment of reliability will be undertaken using the approach defined in TAG for urban roads.	The quantified reliability assessment is currently not available.			Moderate Beneficial		
	Physical activity	The physical activity impact assessment relates to any changes in the ability to undertake activities such as walking and cycling. There is no access available to pedestrians or cyclists on the M42 but there is some access on the A45 and across the circulatory carriageway of J6. A cycle route, which links Solihull and the airport, NEC and future HS2 terminal will not be directly impacted by this option although the introduction of traffic could lead to adverse impacts on the amenity of this route. These levels of provision will be maintained with scheme design resulting in no change to this impact.	To be assessed as part of the NMU Audit process during scheme design.			Neutral		
	Journey quality	The provision of the new, high standard links is expected to alleviate congestion and improve journey time reliability. Enhanced signage will provide clear and unambiguous information to the driver. Accordingly, with the scheme in place, driver stress is predicted to be lower.	N/A			Beneficial		
	Accidents	An assessment of the accidents has been carried out using COBALT. Under Option 1, some traffic is reassigned from the M42 on to the new link road to the Clock interchange. In addition the enhanced network capacity provided by the scheme attracts more traffic from local roads to use the M42. The net impact has been assessed as neutral.	Option 1 is predicted to produce a reduction of 62 accidents with an associated 72 casualties over the appraisal period.				-£7.1m	
	Security	Highways England guidance for the application of TAG to road schemes advises that roads should never have anything other than a negligible effect on security.	N/A			Neutral		
	Access to services	The provision of the new road links together with the associated reduction in congestion at Junction 6, will improve the connectivity, reliability and resilience of the network in the vicinity of the airport and rail stations.	N/A			Beneficial		
	Affordability	An assessment of affordability will be carried out using a distributional impact analysis in accordance with TAG Unit A4.1.	Not assessed at this stage pending completion of a full TUBA assessment.			Neutral		
	Severance	The issue of severance in the context of the scheme concerns those using non-motorised modes, particularly pedestrians (WebTAG Unit A4.1, S5). Currently there are no signalised pedestrian crossing facilities at Junction 6. However, there are pedestrian footways along the southern side of the junction. At present there are no proposals to alter these arrangements. Without mitigation moderate to substantial adverse impacts are anticipated where Option 1 severs seven Public Rights of Way.	To be quantified during development of the scheme design.			Not fully assessed at this stage		
	Option and non-use values	The scheme does not involve the loss or introduction of a new mode of transport, accordingly option values are unaffected. However, it can be argued that improvements to M42 Junction 6 provide an indirect contribution to the achievement of the option value enhancements arising from HS2 but in themselves are considered to have a neutral Option Values / Non-Use Values impact for the scheme assessment.	N/A			N/A		
Public Accou	Cost to Broad Transport Budget	All costs are attributable to Central Government.	£212.9m			N/A	£212.9m	
	Indirect Tax Revenues	The scheme results in a small loss to the Exchequer in terms of indirect tax revenues.	-£3.2m			N/A	-£3.2m	

Appraisal Summary Table

Date produced:	26/05/2017	**Contact:**	
Name of scheme:	M42 Junction 6 Improvements - Option 2	**Name**	S Bourne
Description of scheme:	Option 2 provides an all movement junction to the south of Junction 6, will connect with the A45 at Clock Interchange. Access to Catherine de Barnes Lane and Bickenhill village will be provided from a new roundabout located to the south of the Clock Interchange. A link to the A45 airport free flow link road will be provided from	**Organisation**	Highways England
		Role	Promoter/Official

Impacts		Summary of key impacts	Assessment				
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	There is an overall improvement in the transport economic efficiency of business users as a result of the scheme, principally in the form of savings in journey time. 8% (£10.4m) of total TEE benefit during normal operation (£125.1m) is attributable to to changes in business journey times and vehicle operating costs.	Value of journey time changes(£): 7.34m Net journey time changes (£) 0 to 2min: -3.20m; 2 to 5min: 33.37m; > 5min: -22.83m				£10.4m	
	Reliability impact on Business users	The M42 and J6 in particular, currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. The Option 2 scheme includes a new link between the M42 and the Clock roundabout that provides a bypass to Junction 6 for trips to the airport, Birmingham Business Park and A45W (including JLR). The link provides a step change in network resilience to incidents and congestion at Junction 6, providing business users with associated reliability benefits. Business users such as JLR who use 'just in time' deliveries for production, rely on high levels of network reliability that the schem is aimed to deliver. Following completion of the operational traffic model, an assessment of reliability will be undertaken using the approach defined in TAG for urban roads.	The quantified reliability assessment is currently not available.			Moderate Beneficial		
	Regeneration	North Solihull is the subject of one of the largest regeneration programmes in England. In addition, there are pockets of deprivation in the Mature Suburbs and Rural Area with low incomes, unemployment and poor health in parts of Bickenhill, Elmdon, Lyndon, Olton and Shirley. The scheme is located at the heart of an area that is the planned focus of significant investment in development and associated infrastructure. Accordingly, there is a significant potential for spin off benefits to the surrounding area, particularly through improved accessibility to employment opportunities afforded by the scheme.	In line with emerging TAG advice, regeneration is assessed as part of the wider economic impact assessment.					
	Wider Impacts	In line with guidance, an assessment covering the output change in imperfectly competitive markets, the tax revenues arising from changes in labour supply, agglomeration and the tax revenues arising from the move to more or less productive jobs has been undertaken using a WITA-compatible tool. The travel time benefits assessed to result from Option 2 directly give rise to improvements in accessibility that, in turn, are forecast to deliver £29.7m net benefits.	The WITA assessment identified a total potential wider benefit of £99.1m, of which 30% (£29.7m) has been assumed to be derived from the highway improvement afforded by the scheme.				£29.7m	
Environmental	Noise	Option 2 works have the potential to increase noise levels due to changes in distance to noise sensitive receptors on the altered roads and the introduction of the new junction, M42 slip roads and link to Airport Way. The new link has the potential to introduce a closer road traffic noise source to some noise sensitive dwellings and other receptors, particularly on the south and eastern side of Bickenhill. Any improvement scheme aimed at relieving congestion and increasing capacity could serve to attract additional vehicular traffic to the vicinity, which in turn could result in increases in noise and vibration. Within 1km of the corridor there are four Defra Noise Important Areas (NIAs): - on the A45 at Elmdon, (reference number 2830); - on the A45 West of jn6, (ref no 2831); - on the M42 South of jn6 (ref no 7481); and - on the West of the M42 further south between Junction 6 and Junction 5 (ref no 7482). The locations of these NIAs and the 10 other noise sensitive receptors are detailed in the constraints plans.	There are 147 dwellings and 9 other noise sensitive receptors within 600 m of the scheme corridor.				Not Calculated	
	Air Quality	The introduction of Option 2 includes a new road source to the east of Bickenhill, creating a potential for the pathway distance of vehicular exhaust emissions between sensitive receptors located along Clock Lane, Pitt Lane, Shadowbrook Lane and 'The Meadows' to decrease, in comparison to the existing road configuration. Option 2 may also require signalling changes and therefore there is potential for changes to the average and peak speeds of road traffic, which could therefore impact on local air quality. No widening of the mainline will be required, other than the provision of merge/diverge from free flow links, and no additional off-line roads will be constructed at Junction 6. Birmingham and Coleshill Air Quality Management Areas (AQMAs) are situated approximately 2.2km from the proposed option. One Pollutant Climate Mapping (PCM) model link (A45) is within 200m of the proposed option.	The approximate number of receptors considered sensitive to changes in air quality within the following distance bandings are given below: 0m - 50m = 10 receptors 50m - 100m = 13 receptors 100m - 200m = 38 receptors Total = 61 receptors				Not Calculated	Not Calculated
	Greenhouse gases	Alleviation of road traffic congestion as a result of the implementation of Option 2 has the potential to reduce greenhouse gas emissions. However, any increase in road traffic flows might negate the potential benefit. Confirmation of changes to traffic flows and speeds along the affected road links would need to be assessed quantitatively.				Not Calculated	Not Calculated	
	Landscape	Option 2 would result in the permanent loss of: • existing woodland within and beyond the highways boundary (including Ancient Woodland); • fragmentation of field patterns around the new link road; • alterations to the existing landform; • increased traffic movements; and • lighting within the landscape. Overall the elements of this option would combine to noticeably increase the footprint and presence of the M42 and the surrounding highways network in the local and wider landscape of the study area.				Moderate Adverse	n/a	
	Townscape	n/a	n/a			n/a	n/a	
	Historic Environment	22 non-designated heritage assets will be directly impacted by Option 2. The assets consist of a mixture of sites dating from the Medieval and Post Medieval periods. The setting of one scheduled monument, 11 listed buildings and one Conservation Area will be impacted upon.	Total number of known heritage assets affected is at least 34			Moderate Adverse		
	Biodiversity	Option 2 will likely result in a moderate adverse impact on Aspbury's Copse Ancient Woodland/Local Wildlife Site (LWS)/Ecosite (ES) and a Slight Adverse impact on Roadside Hedge LWS/ES and Main Birmingham to London Railway Line ES due to direct land-take. The option will also result in Slight Adverse impacts to Hollywell Brook LWS due to in-stream works and culvert extension. This option will also likely impact: Coleshill and Bannerly Pools SSSI, Bickenhill Meadows SSSI, Castle Hill Farm Meadows LWS, Green Wards Piece LWS/ES, Wayside Cottage Meadows LWS/ES, Bickenhill Churchyard ES, Clock Lane Meadows ES and Meadows to the East of the Jungle ES due to increased nitrogen deposition. The magnitude of this impact is currently unknown. Option 2 will result in the loss of UK and Local Biodiversity Action Plan (BAP) habitats, resulting in a Neutral or Slight Adverse impact. Replacement hedgerows may provide an improvement in habitat quality and result in a Neutral or Slight positive impact. This option will also likely impact on protected and notable fauna, if present. Impacts are currently unknown but are likely to be Neutral to Slight Adverse.	Not calculated			Moderate Adverse		
	Water Environment	Surface water features in the area comprise of: Hollywell Brook, unnamed tributary of Shadow Brook, Shadow Brook, Blythe from Temple Balsall Brook to Patrick Bridge, Blythe river from Patrick Bridge to River Tame, unnamed tributaries of the Low Brook, plus other field drains. One groundwater body is assessed (Tame Anker Mease Secondary Combined). A number of standing waterbodies were assessed, including unnamed ponds. A number of surface water abstractions are located in the study area. The construction and operation of the M42 J6 Option 2 is likely to have a Moderate Adverse impact upon the surrounding water environment, with the highest risk being of increased flood risk. Effects on surface watercourses include potential pollution from routine run-off/accidental spillage as three new outfalls to surface watercourses are proposed with Slight Adverse impacts predicted. Option 2 features a larger impermeable surface area, three new culverts, two existing culverts lengthened and changes to flow downstream as a result of cut-off on two ditches. In relation to groundwater, there is a Slight Adverse impact on the potential indirect loss of Groundwater Dependent Terrestrial Ecosystems (located within 250m and a result of greater lengths of cutting with the potential to impact groundwater quality and flow). The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.	n/a			Moderate Adverse	n/a	
Social	Commuting and Other users	There is an overall improvement in the transport economic efficiency of commuting and other users as a result of the scheme, principally in the form of savings in journey time. 92% (£114.7m) of total TEE benefit during normal operation (£125.1m) is attributable to to changes in non-business journey times and vehicle operating costs.	Value of journey time changes(£): 118.04m Net journey time changes (£) 0 to 2min: 29.27m; 2 to 5min: 50.56m; > 5min: 38.21m				£114.7m	
	Reliability impact on Commuting and Other users	The M42 and J6 in particular, currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. The Option 2 scheme includes a new link between the M42 and the Clock roundabout that provides a bypass to Junction 6 for trips to the airport, Birmingham Business Park and A45W (including JLR). The link provides a step change in network resilience to incidents and congestion at Junction 6, providing commuters and air passengers in particular with associated reliability benefits. Following completion of the operational traffic model, an assessment of reliability will be undertaken using the approach defined in TAG for urban roads.	The quantified reliability assessment is currently not available.			Moderate Beneficial		
	Physical activity	The physical activity impact assessment relates to any changes in the ability to undertake activities such as walking and cycling. There is no access available to pedestrians or cyclists on the M42 but there is some access on the A45 and across the circulatory carriageway of J6. A cycle route, which links Solihull and the airport, NEC and future HS2 terminal will not be directly impacted by this option although the introduction of traffic could lead to adverse impacts on the amenity of this route. These levels of provision will be maintained with scheme design resulting in no change to this impact.	To be assessed as part of the NMU Audit process during scheme design.			Neutral		
	Journey quality	The provision of the new, high standard links is expected to alleviate congestion and improve journey time reliability. Enhanced signage will provide clear and unambiguous information to the driver. Accordingly, with the scheme in place, driver stress is predicted to be lower.	N/A			Beneficial		
	Accidents	An assessment of the accidents will be carried out using COBALT.	An assessment of the accidents will be carried out using COBALT. The results are expected to be similar to those achieved for Option 1 (£2.4m benefit) but marginally reduced in value due to the additional roundabout south of the Clock interchange on the new link in Option 2. This additional junction introduces an increase in the number of conflict points which, in turn, can be expected to give rise to a higher number of accidents than Option 1.				-£8.8m	
	Security	Highways England guidance for the application of TAG to road schemes advises that roads should never have anything other than a negligible effect on security.	N/A			Neutral		
	Access to services	The provision of the new road links together with the associated reduction in congestion at Junction 6, will improve the connectivity, reliability and resilience of the network in the vicinity of the airport and rail stations.	N/A			Beneficial		
	Affordability	An assessment of affordability will be carried out using a distributional impact analysis in accordance with TAG Unit A4.1.	Not assessed at this stage pending completion of a full TUBA assessment.			Neutral		
	Severance	The issue of severance in the context of the scheme concerns those using non-motorised modes, particularly pedestrians (WebTAG Unit A4.1, S5). Currently there are no signalised pedestrian crossing facilities at Junction 6. However, there are pedestrian footways along the southern side of the junction. At present there are no proposals to alter these arrangements.	To be quantified during development of the scheme design.			Not fully assessed at this stage		
	Option and non-use values	The scheme does not involve the loss or introduction of a new mode of transport, accordingly option values are unaffected. However, it can be argued that improvements to M42 Junction 6 provide an indirect contribution to the achievement of the option value enhancements arising from HS2 but in themselves are considered to have a neutral Option Values / Non-Use Values impact for the scheme assessment.	N/A			N/A		
Public Accounts	Cost to Broad Transport Budget	All costs are attributable to Central Government	204.4m			N/A	£204.4m	
	Indirect Tax Revenues	The scheme results in a small loss to the Exchequer in terms of indirect tax revenues.	-6.5m			N/A	-£6.5m	

Appraisal Summary Table

Date produced:	26/05/2017

Contact:	
Name	S Bourne
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	M42 Junction 6 Improvements - Option 3
Description of scheme:	Option 3 provides free flow left turns at all arms on Junction 6. In addition, a northbound exit slip and southbound entry slip on the M42, to the south of Junction 6, will connect with the A45 at Clock Interchange, via a new Bickenhill roundabout. This roundabout will also connect to the existing northbound dedicated link to the airport.

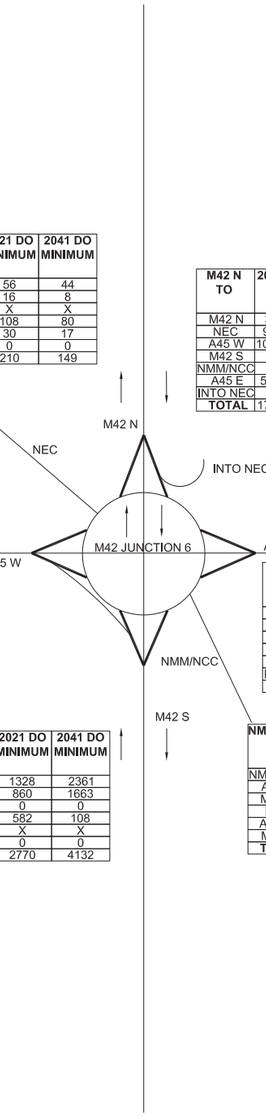
Impacts		Summary of key impacts	Assessment					
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	There is an overall improvement in the transport economic efficiency of business users as a result of the scheme, principally in the form of savings in journey time. 41% (£137.4m) of total TEE benefit during normal operation (£370.7m) is attributable to to changes in business journey times and vehicle operating costs.	Value of journey time changes(£) 137.45m Net journey time changes (£) 0 to 2min: 23.14m; 2 to 5min: 67.54m; > 5min: 46.77m				£153.8m	
	Reliability impact on Business users	The M42 and J6 in particular, currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. The Option 3 scheme provides an additional diverge and merge from/to M42, located to the south of the existing junction 6 south facing slip roads with the links then connecting to Clock Interchange and Airport way via a new Bickenhill roundabout that provides a bypass to Junction 6 for trips to the airport, Birmingham Business Park and A45W (including JLR). The link provides a step change in network resilience to incidents and congestion at Junction 6, providing business users with associated reliability benefits. Business users such as JLR who use 'just in time' deliveries for production, rely on high levels of network reliability that the schem is aimed to deliver. Following completion of the operational traffic model, an assessment of reliability will be undertaken using the approach defined in TAG for urban roads.	The quantified reliability assessment is currently not available.			Moderate Beneficial		
	Regeneration	North Solihull is the subject of one of the largest regeneration programmes in England. In addition, there are pockets of deprivation in the Mature Suburbs and Rural Area with low incomes, unemployment and poor health in parts of Bickenhill, Elmdon, Lyndon, Olton and Shirley. The scheme is located at the heart of an area that is the planned focus of significant investment in development and associated infrastructure. Accordingly, there is a significant potential for spin-off benefits to the surrounding area, particularly through improved accessibility to employment opportunities afforded by the scheme.	In line with emerging TAG advice, regeneration is assessed as part of the wider economic impact assessment.					
	Wider Impacts	In line with guidance, an assessment covering the output change in imperfectly competitive markets, the tax revenues arising from changes in labour supply, agglomeration and the tax revenues arising from the move to more or less productive jobs has been undertaken using a WITA-compatible tool. The significant travel time benefits assessed to result from Option 3 directly give rise to improvements in accessibility that, in turn, are forecast to deliver £88m net benefits.	The WITA assessment identified a total potential wider benefit of £293.0m, of which 30% (£87.9m) has been assumed to be derived from the highway improvement afforded by the scheme.				£87.9m	
Environmental	Noise	Option 3 has the potential to increase noise levels at a few sensitive receptors in the area of roads and due to the introduction of the new link to Airport Way. The new link has the potential to introduce a closer road traffic noise source to some noise sensitive dwellings and other receptors, particularly on the eastern side of Bickenhill. Any improvement scheme aimed at relieving congestion and increasing capacity could serve to attract additional vehicular traffic to the vicinity, which in turn could result in increases in noise and vibration. Within 1km of the corridor there are four Defra Noise Important Areas (NIAs): • on the A45 at Elmdon, (reference number 2830); • on the A45 West of Junction 6, (ref no 2831); • on the M42 South of Junction 6 (ref no 7481); and • on the West of the M42 further south between Junction 5 and Junction 6 (ref no 7482).	There are 144 dwellings and 9 other noise sensitive receptors within 600 m of the scheme corridor.			n/a	Not Calculated	
	Air Quality	Option 3 has the potential to impact local air quality at sensitive receptors in proximity to: Clock Interchange, Church Lane and Pitt Lane. This includes residential dwellings adjacent to Clock Lane in proximity to the Clock Interchange and the area known as 'The Meadows' along Church Lane. Option 3 may require signalling changes and therefore there is potential for changes to the average and peak speeds of road traffic, which could impact local air quality. No widening of the mainline will be required, other than the provision of merge/diverge from free flow links, and no additional off-line roads will be constructed at Junction 6. Birmingham and Coleshill Air Quality Management Areas (AQMAs) are situated approximately 2.2km from the proposed option. One Pollutant Climate Mapping (PCM) model link (A45) is located within 200m of the proposed option.	Approximate numbers of receptors considered sensitive to changes in air quality are given below: 0m - 50m = 4 receptors 50m -100m = 10 receptors 100m - 200m = 41 receptors Total = 55 receptors				Not Calculated	Not Calculated
	Greenhouse gases	Alleviation of road traffic congestion as a result of the implementation of Option 3 has the potential to reduce greenhouse gas emissions. However, any increase in road traffic flows might negate potential benefits. Confirmation of changes to traffic flows and speeds along the affected road links would be required to produce a quantitative assessment.				Not Calculated	Not Calculated	
	Landscape	Option 3 would result in the permanent loss of: • fragmentation of field patterns around the new link road; • alterations to the existing landform; • detractions to the setting of Bickenhill and loss of residential properties • increased traffic movements; and • lighting within the landscape Overall, the new link road and junction with the A45 would noticeably increase the existing presence of the M42 and A45 corridors in an area already heavily influenced by transport corridor and would further urbanise the setting of Bickenhill. However, Option 3 would not result in significant changes to the perception of the landscape in the wider study area	Not Calculated			Slight Adverse	n/a	
	Townscape	n/a	n/a			n/a	n/a	
	Historic Environment	Overall the new link road and junction with the A45 would noticeably increase the existing presence of the M42 and A45 corridors in an area already heavily influenced by transport corridors and would further urbanise the setting of Bickenhill. However, overall Option 3 would not result in significant changes to the perception of the landscape in the wider study area.	Total number of known heritage assets affected is at least 20.			Moderate Adverse		
	Biodiversity	Option 3 will likely result in a Slight Adverse impact on Main Birmingham to London Railway Line Ecosite (ES) due to direct land-take. The option will also result in Slight Adverse impacts to Hollywell Brook Local Wildlife Site (LWS) due to in-stream works and culvert extension. This option will also likely impact: Coleshill and Bannerly Pools Site of Special Scientific Interest (SSSI), Bickenhill Meadows SSSI, Castle Hill Farm Meadows LWS, Green Wards Piece LWS/ES, Wayside Cottage Meadows LWS/ES, Bickenhill Churchyard ES, Clock Lane Meadows ES and Meadows to the East of the Jungle ES due to increased nitrogen deposition. The magnitude of this impact is currently unknown. Option 3 will result in the loss of UK and Local Biodiversity Action Plan (BAP) habitats, resulting in a Neutral to Slight Adverse impact. Replacement hedgerows may provide an improvement in habitat quality and result in a Neutral to Slight Beneficial impact. This option will also likely impact on protected and notable fauna, if present. Impacts are currently unknown but are likely to be Neutral to Slight Adverse	Not Calculated			Slight Adverse		
	Water Environment	Surface water features in the area comprise of: Hollywell Brook, an unnamed tributary of the Shadow Brook, Blythe from Patrick Bridge to River Tame, unnamed tributary of the Low Brook, plus other field drains. One groundwater body is assessed (Tame Anker Mease Secondary Combined). A number of standing waterbodies were assessed, including Pendingo Lake and other unnamed ponds. A number of surface and groundwater abstractions are located in the study area. The construction and operation of the M42 J6 Option 3 is likely to have a Moderate Adverse impact upon the surrounding water environment, with the highest risk being on increased flood risk. Effects on surface watercourses include potential pollution from routine run-off/accidental spillage with three new outfalls to surface watercourses proposed with Slight Adverse impacts predicted. Option 3 features a relatively smaller impermeable surface area, two new culverts and three existing culverts lengthened. In relation to groundwater, there is a Slight Adverse impact as a result of cuttings with the potential to impact groundwater quality and flow, although the length of cutting is smaller than Options 1 and 2. The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.	n/a			Moderate Adverse	n/a	
Social	Commuting and Other users	There is an overall improvement in the transport economic efficiency of commuting and other users as a result of the scheme, principally in the form of savings in journey time. 59% (£216.9m) of total TEE benefit during normal operation (£370.7m) is attributable to to changes in non-business journey times and vehicle operating costs.	Value of journey time changes(£) 210.49m Net journey time changes (£) 0 to 2min: 58.18m; 2 to 5min: 91.74m; > 5min: 60.57m				£216.9m	
	Reliability impact on Commuting and Other users	The M42 and J6 in particular, currently operate close to capacity so any incident or volume increase on the network in the vicinity has an impact on the journey reliability. The Option 3 scheme provides an additional diverge and merge from/to M42, located to the south of the existing junction 6 south facing slip roads with the links then connecting to Clock Interchange and Airport way via a new Bickenhill roundabout that provides a bypass to Junction 6 for trips to the airport, Birmingham Business Park and A45W (including JLR). The link provides a step change in network resilience to incidents and congestion at Junction 6, providing commuters and air passengers in particular with associated reliability benefits. Following completion of the operational traffic model, an assessment of reliability will be undertaken using the approach defined in TAG for urban roads.	The quantified reliability assessment is currently not available.			Moderate Beneficial		
	Physical activity	The physical activity impact assessment relates to any changes in the ability to undertake activities such as walking and cycling. There is no access available to pedestrians or cyclists on the M42 but there is some access on the A45 and across the circulatory carriageway of J6. A cycle route, which links Solihull and the airport, NEC and future HS2 terminal will not be directly impacted by this option although the introduction of traffic could lead to adverse impacts on the amenity of this route. These levels of provision will be maintained with scheme design resulting in no change to this impact.	To be assessed as part of the NMU Audit process during scheme design.			Neutral		
	Journey quality	The provision of the new, high standard links is expected to alleviate congestion and improve journey time reliability. Enhanced signage will provide clear and unambiguous information to the driver. Accordingly, with the scheme in place, driver stress is predicted to be lower.	N/A			Beneficial		
	Accidents	An assessment of the accidents will be carried out using COBALT.	An assessment of the accidents will be carried out using COBALT. The results are expected to be similar to those achieved for Option 1 (£2.4m benefit) but marginally reduced in value due to the additional roundabout south of the Clock interchange on the new link in Option 3. This additional junction introduces an increase in the number of conflict points which, in turn, can be expected to give rise to a higher number of accidents than Option 1.				-£4.3m	
	Security	Highways England guidance for the application of TAG to road schemes advises that roads should never have anything other than a negligible effect on security.	N/A			Neutral		
	Access to services	The provision of the new road links together with the associated reduction in congestion at Junction 6, will improve the connectivity, reliability and resilience of the network in the vicinity of the airport and rail stations.	N/A			Beneficial		
	Affordability	An assessment of affordability will be carried out using a distributional impact analysis in accordance with TAG Unit A4.1.	Not assessed at this stage pending completion of a full TUBA assessment.			Neutral		
	Severance	The issue of severance in the context of the scheme concerns those using non-motorised modes, particularly pedestrians (WebTAG Unit A4.1, S5). Currently there are no signalised pedestrian crossing facilities at Junction 6. However, there are pedestrian footways along the southern side of the junction. At present there are no proposals to alter these arrangements.	To be quantified during development of the scheme design.			Not fully assessed at this stage		
	Option and non-use values	The scheme does not involve the loss or introduction of a new mode of transport, accordingly option values are unaffected. However, it can be argued that improvements to M42 Junction 6 provide an indirect contribution to the achievement of the option value enhancements arising from HS2 but in themselves are considered to have a neutral	N/A			N/A		
Public Accounts	Cost to Broad Transport Budget	All costs are attributable to Central Government.	174.58m			N/A	£174.58m	
	Indirect Tax Revenues	The scheme results in a small gain to the Exchequer in terms of indirect tax revenues.	0.49m			N/A	£0.49m	

Appendix H – Traffic Flow Schematics

NEC TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
M42 N	43	31	38	56	44
A45 E	35	5	13	16	8
NMM/NCC	3	2	2	X	X
M42 S	110	108	97	108	80
A45 W	58	48	38	30	17
NEC	3	0	0	0	0
TOTAL	252	194	188	210	149

M42 N TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
M42 N	3	8	7	0	0
NEC	90	144	5	0	0
A45 W	1087	1018	1001	1276	1364
M42 S	7	2	1	0	0
NMM/NCC	1	16	13	X	X
A45 E	598	497	532	590	227
INTO NEC	0	0	0	X	X
TOTAL	1786	1685	1559	1866	1591

A45 W TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
NEC	230	478	238	574	1180
M42 N	600	615	616	699	1131
A45 E	2	2	23	1	0
NMM/NCC	4	15	37	X	X
M42 S	562	444	452	429	870
A45 W	2	1	33	0	0
TOTAL	1400	1555	1399	1703	3181



A45 E TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
A45 E	5	1	2	0	0
M42 N	580	489	553	547	686
NEC	60	202	18	19	26
A45 W	22	17	22	0	0
M42 S	978	995	961	744	788
NMM/NCC	9	8	165	X	X
TOTAL	1654	1712	1721	1310	1500

M42 S TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
A45 W	835	1105	819	1328	2361
NEC	511	753	528	860	1663
M42 N	5	9	12	0	0
A45 E	961	956	695	582	108
NMM/NCC	10	3	0	X	X
M42 S	0	0	10	0	0
TOTAL	2322	2826	2064	2770	4132

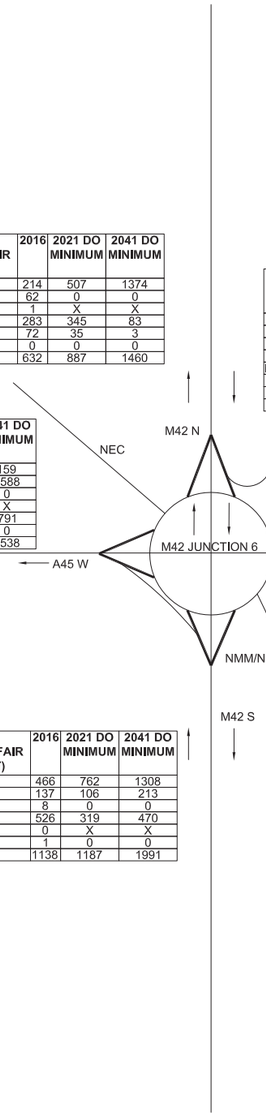
NMM/NCC TO	2012	2012 (SPRING FAIR EVENT)	2016
NMM/NCC	0	0	0
A45 E	0	0	4
M42 N	1	1	1
NEC	3	6	0
A45 W	4	5	26
M42 S	1	2	1
TOTAL	9	14	32

AM PEAK FLOWS

NEC TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
M42 N	183	404	214	507	1374
A45 E	39	11	62	0	0
NMM/NCC	0	0	1	X	X
M42 S	194	432	283	345	83
A45 W	104	188	72	35	3
NEC	1	0	0	0	0
TOTAL	521	1035	632	887	1460

M42 N TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
M42 N	1	6	5	0	0
NEC	37	14	3	0	329
A45 W	900	961	896	972	1258
M42 S	2	9	4	0	0
NMM/NCC	3	1	0	X	X
A45 E	255	352	425	657	629
INTO NEC	0	0	0	X	X
TOTAL	1198	1343	1333	1629	2216

A45 W TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
NEC	45	65	125	64	159
M42 N	1029	877	1000	1786	2588
A45 E	14	9	52	2	0
NMM/NCC	2	3	8	X	X
M42 S	976	851	407	509	791
A45 W	1	0	31	0	0
TOTAL	2067	1805	1623	2361	3538



A45 E TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
A45 E	5	3	5	0	0
M42 N	846	924	749	494	625
NEC	34	16	8	29	162
A45 W	9	10	19	0	0
M42 S	895	928	873	770	926
NMM/NCC	1	0	6	X	X
TOTAL	1790	1881	1660	1293	1713

M42 S TO	2012	2012 (SPRING FAIR EVENT)	2016	2021 DO MINIMUM	2041 DO MINIMUM
A45 W	516	464	466	762	1308
NEC	108	153	137	106	213
M42 N	4	6	8	0	0
A45 E	580	599	526	319	470
NMM/NCC	2	2	0	X	X
M42 S	0	0	1	0	0
TOTAL	1210	1224	1138	1187	1991

NMM/NCC TO	2012	2012 (SPRING FAIR EVENT)	2016
NMM/NCC	0	0	0
A45 E	0	0	28
M42 N	2	3	20
NEC	1	6	3
A45 W	9	3	17
M42 S	6	5	24
TOTAL	18	17	92

PM PEAK FLOWS

NOTES

1. 2012 AM & PM PEAK FIGURES OBTAINED FROM AN ECONOMY STUDY REPORT (REF: M91214458/ 001) FOR THE M42 JUNCTION 6 MAC 9 PPP SCHEME.
2. 2016 MANUAL COUNT DATA (FEBRUARY)
3. 2021 & 2041 DO MINIMUM INFORMATION FROM LOCAL AREA MODEL. 2021 IS REPRESENTATIVE OF A SCHEME OPENING YEAR (2023) AND 2041 REPRESENTATIVE OF A DESIGN YEAR (2038).
4. DO MINIMUM AM PEAK IS FROM 0800 TO 0900.
5. DO MINIMUM PM PEAK IS FROM 1700 TO 1800.
6. DO MINIMUM NETWORK INCLUDES HS2 ENABLING WORKS AT M6 JUNCTION 4, STONEBRIDGE ISLAND AND BIRMINGHAM BUSINESS PARK.

KEY

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P03	TITLE AMENDED + DO MINIMUM DATA ADDED	TO	DM	GMAC	JUNE 17
P02	2012 & 2016 MANUAL COUNT DATA INCLUDED	DM	DM	GMAC	APR 17

Project: **WEST MIDLANDS AREA 9**
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title: **M42 JUNCTION 6**
TURNING MOVEMENTS (AM & PM)
EXISTING & DO MINIMUM

Office: KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD
WEST MIDLANDS, B72 1PH
www.mouchel.com

Client: Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
NTS	BAA	JC/DM	GMAC	RJ
Orgiinal Size: A1	Date: AUG 16	Date: AUG 16	Date: AUG 16	Date: AUG 16

Status: SUITABLE FOR INFORMATION

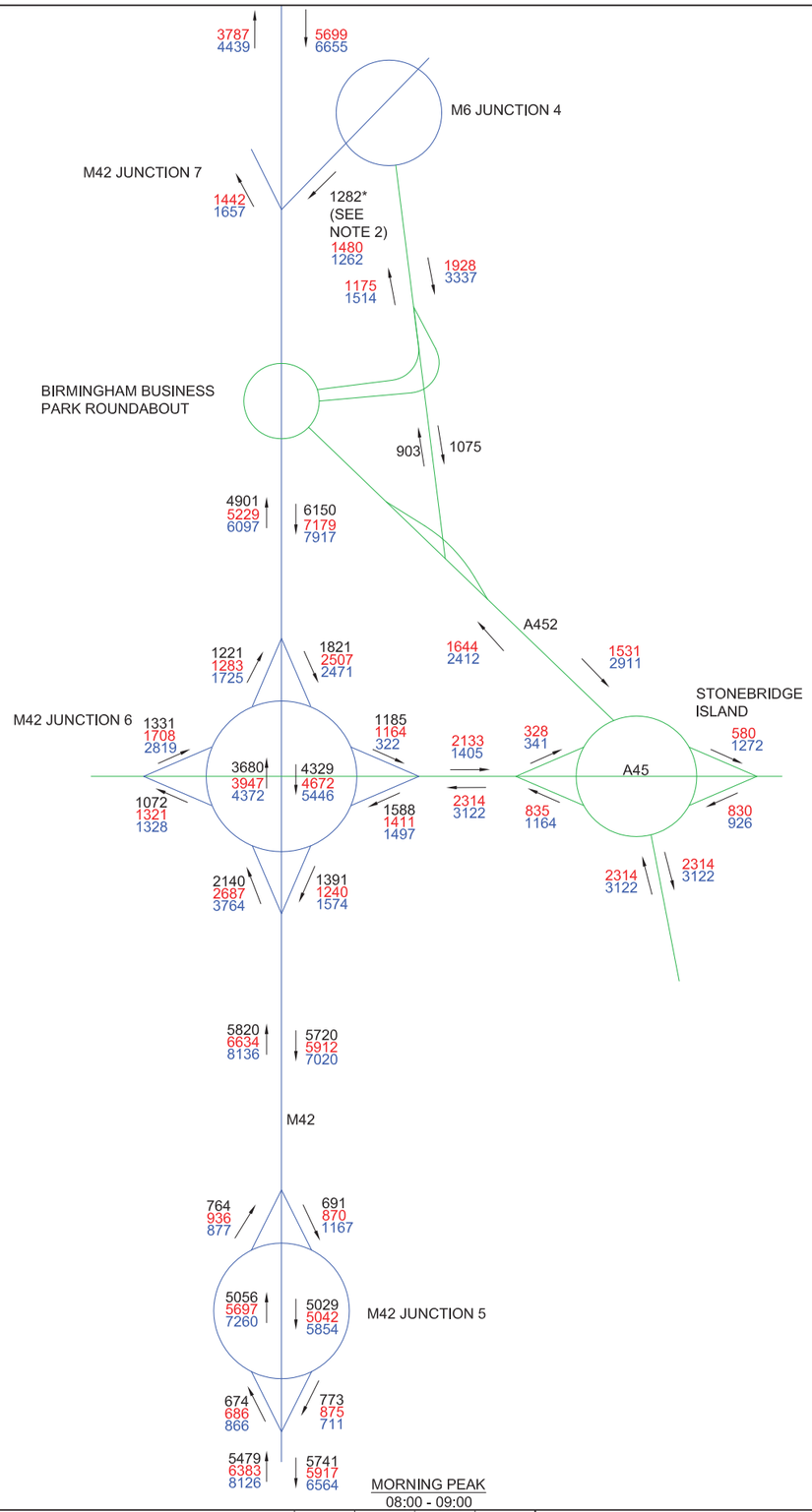
Drawing No: Project | Originator | Volume
HE551485 - MOU - VTR
M42_J6 - SK - CH - 0001

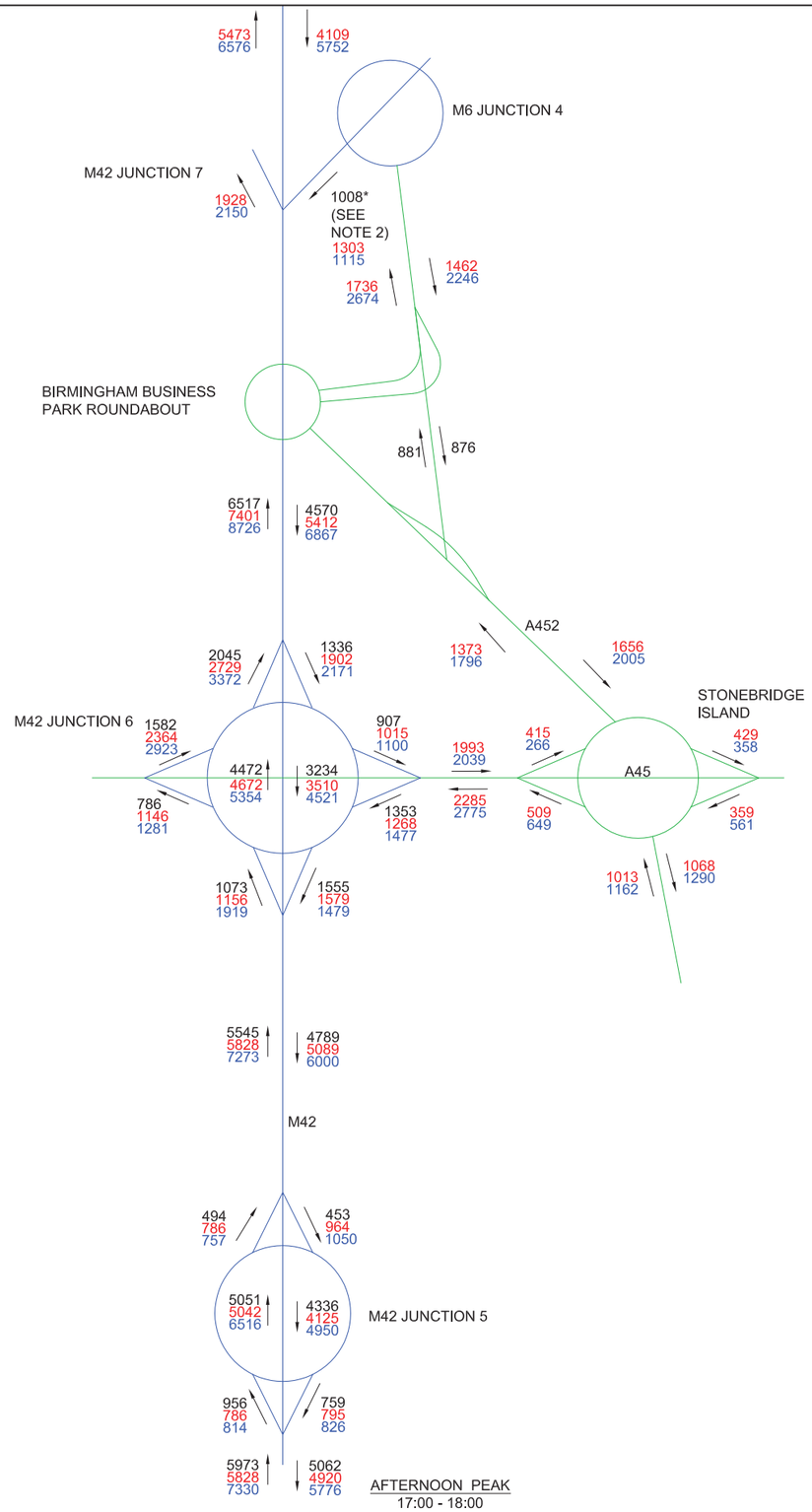
Suitability: S2

Revision: P03

Location | Type | Role | Number

filepath: W:\Highways\TRANSPORT JOBS\107\1038 M42 J6 RIP Stage 1\16 Drawings\1b_04 Drawings Working\Sketches\HE551485-MOU-VTR-M42_JK-SK-CH-0001_P03.dwg
plot date: 13/06/2017 10:23:43
by: Darren Morris





NOTES

1. DATA FOR 2016 PEAK FLOWS OBTAINED FROM MOUCHEL SITE SURVEY 26TH FEBRUARY 2016.
2. ADDITIONAL DATA MARKED WITH ASTERISK FROM MOUCHEL SITE SURVEY 17TH MARCH 2016.
3. AM PEAK IS 0800 TO 0900 HOURS
4. PM PEAK IS 1700 TO 1800 HOURS
5. 2021& 2041 DO MINIMUM FLOWS FROM LOCAL AREA MODEL (LAM). THESE HAVE BEEN USED TO REPRESENT AN OPENING (2023) AND DESIGN (2038) YEARS.

KEY

1000	2016 PEAK FLOWS
1000	2021 PEAK FLOWS (LAM)
1000	2041 PEAK FLOWS (LAM)

Revision	Amendment	Drawn/Designed	Checked	Approved	Date
P02	2021 & 2041 DO MINIMUM ADDED, 2031 PRISM REMOVED	TO	DM	GM	JUNE 17

Project
WEST MIDLANDS AUTUMN STATEMENT 2014 M42 JUNCTION 6 IMPROVEMENTS

Drawing Title
TRAFFIC FLOW SCHEMATIC AM & PM PEAKS EXISTING & DO MINIMUM (2021 & 2041)

Office
mouchel
building great relationships
KNIGHTS HOUSE, 2 PARADE
SUTTON COLDFIELD
WEST MIDLANDS, B72 1PH
www.mouchel.com

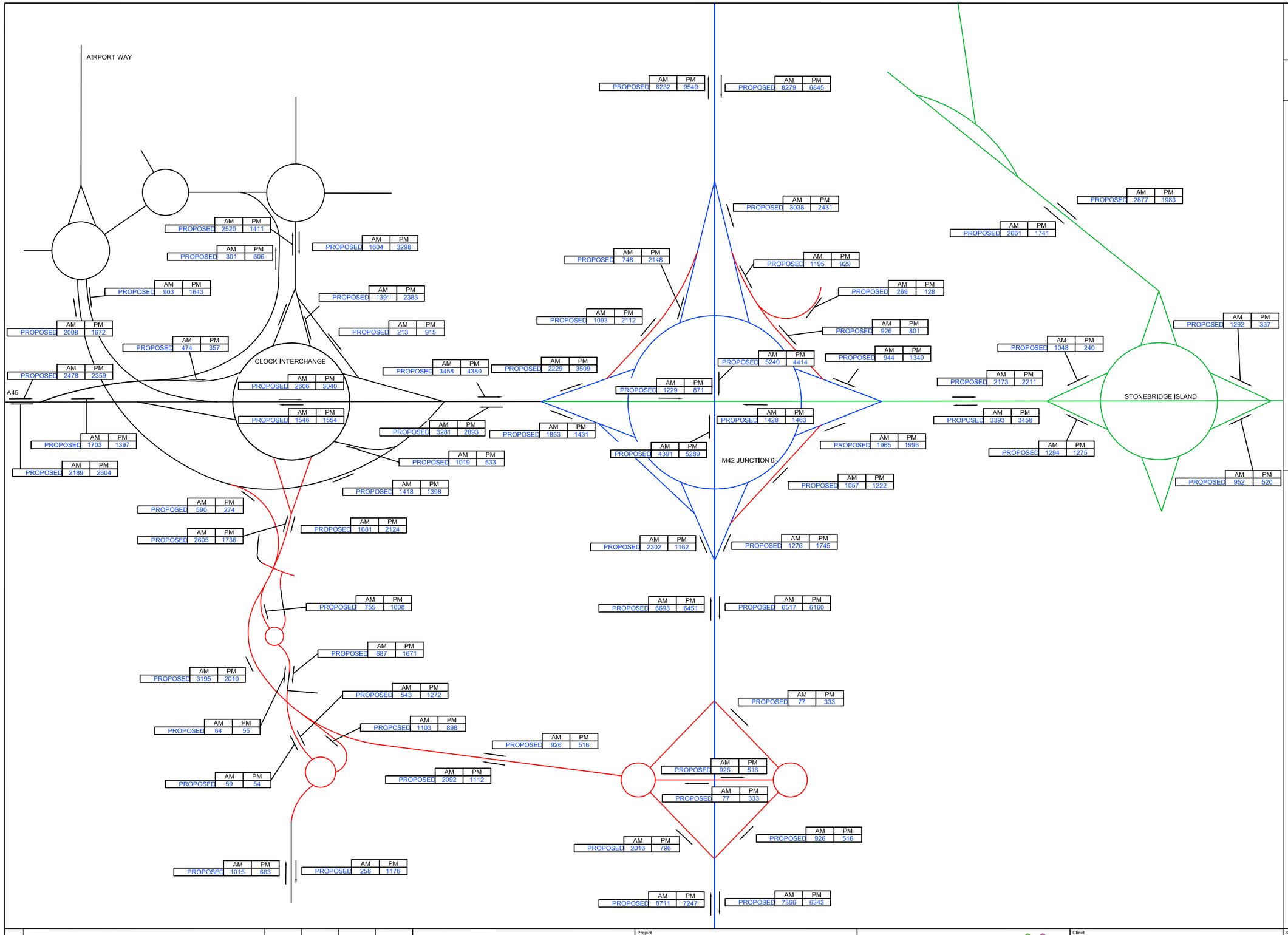
Client
Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
NTS	DM	GM	GM	RJ
Orig'nal Size	Date	Date	Date	Date
A1	SEP 16	NOV 16	NOV 16	NOV 16

Status: SUITABLE FOR INFORMATION

Drawing No				Suitability
Project	Originator		Volume	S2
HE551485 -	MOU	-	VTR	Revision
M42_J6 -	SK	- CH -	0003	P02
Location	Type	Role	Number	

filepath: W:\Highways\TRANSPORT JOBS\10710\38 M42 J6 RIP Stage 1\10 Drawings\16_04 Drawings Working\Sketches\HE551485-MOU-VTR-M42_J6-SK-CH-0003.dwg
plot date: 15/02/2017 10:26:47
by: Darren Morris



NOTES

1. DO NOT SCALE FROM THIS DRAWING.
2. PROPOSED FLOWS ARE PRODUCED FROM LOCAL AREA MODEL 2038 FORECAST.
3. ALL FLOWS SHOWN ARE AM OR PM PEAKS.
4. FOR EXISTING AND DO MINIMUM FLOWS SEE DRAWING HE551485-MOU-VTR-M42_J6-SK-CH-0003.

KEY

- INDICATING DIRECTIONAL FLOW OF TRAFFIC
- HIGHWAY TRAFFIC FLOW SCHEMATICS MOTORWAY
- HIGHWAY TRAFFIC FLOW SCHEMATICS TRUNK ROADS
- HIGHWAY TRAFFIC FLOW SCHEMATICS LOCAL AUTHORITY ROADS
- PROPOSED HIGHWAY TRAFFIC FLOW SCHEMATIC
- #### 2041 PEAK TRAFFIC FLOWS WITH OPTION 1

Revision	Amendment	Drawn/Designed	Checked	Approved	Date

Project: **WEST MIDLANDS AREA 9**
M42 JUNCTION 6 IMPROVEMENTS

Drawing Title: **OPTION 1**
TRAFFIC FLOW SCHEMATIC
2041 PEAKS

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Office
KNIGHTS HOUSE, 2 PARADE SUTTON COLDFIELD, B72 1PH
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Client: Working on behalf of highways england

Scale	Designed / Drawn	Checked	Approved	Authorised
NTS	TO	DM	GM	RJ
Original Size	Date	Date	Date	Date
A1	JUN 17	JUN 17	JUN 17	JUN 17

Status: SUITABLE FOR INFORMATION

Drawing No				Suitability
Project	Originator	Volume		S2
HE551485 -	MOU -	VTR		
M42_J6 -	SK -	CH -	0008	Revision P01
Location	Type	Role	Number	

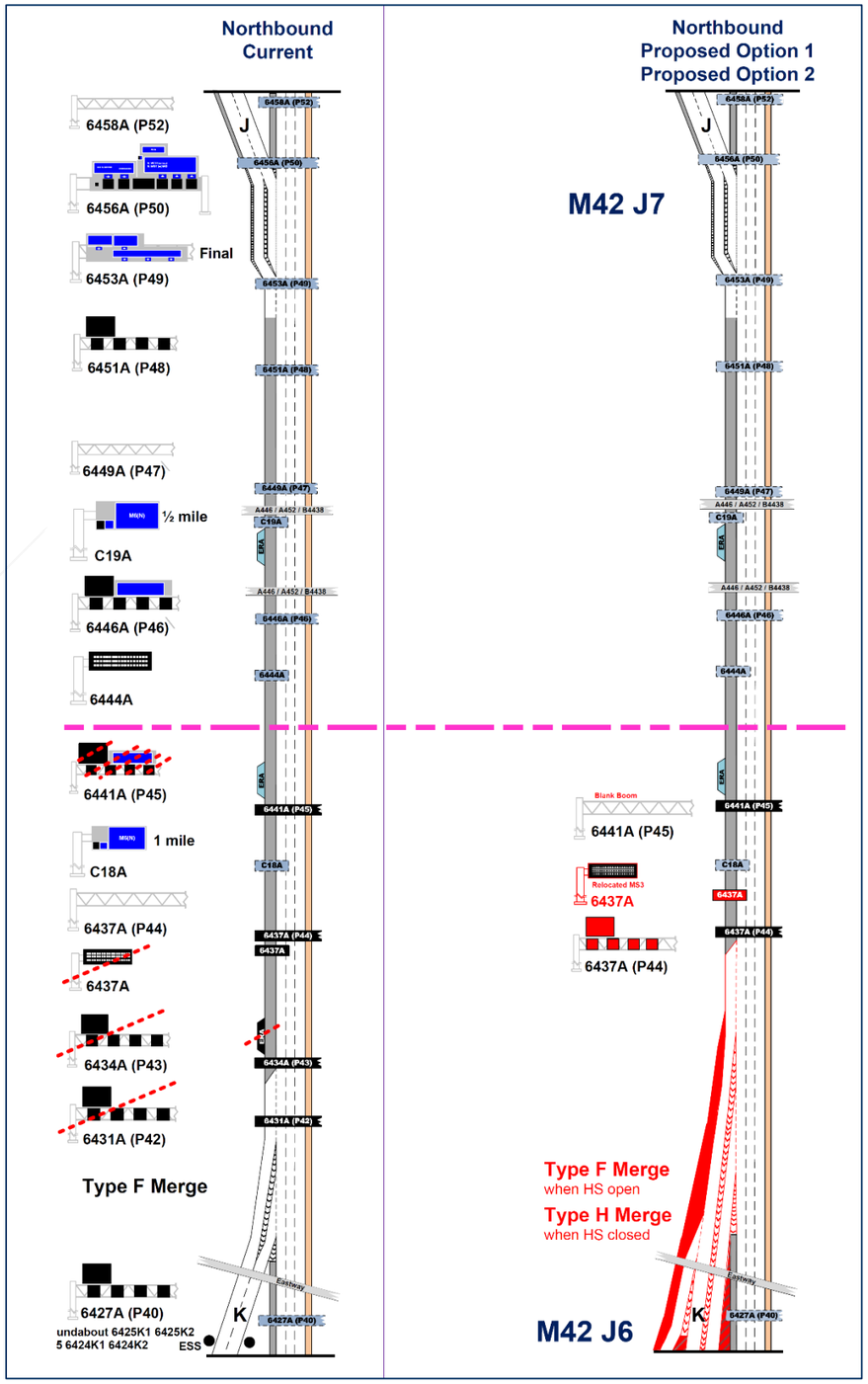
plot date: 15/06/2017 12:20:54
by: Jamie Clift
filepath: W:\Highways\TRANSPORT - JOBS\107\1038 M42_J6 RIP Stage 1\16 Drawings\16_04 Drawings Working\Sketches\HE551485-MOU-VTR-M42_J6-SK-CH-0008.dwg

Appendix I – Technology & Maintenance Assessment

Technology and Maintenance Assessment

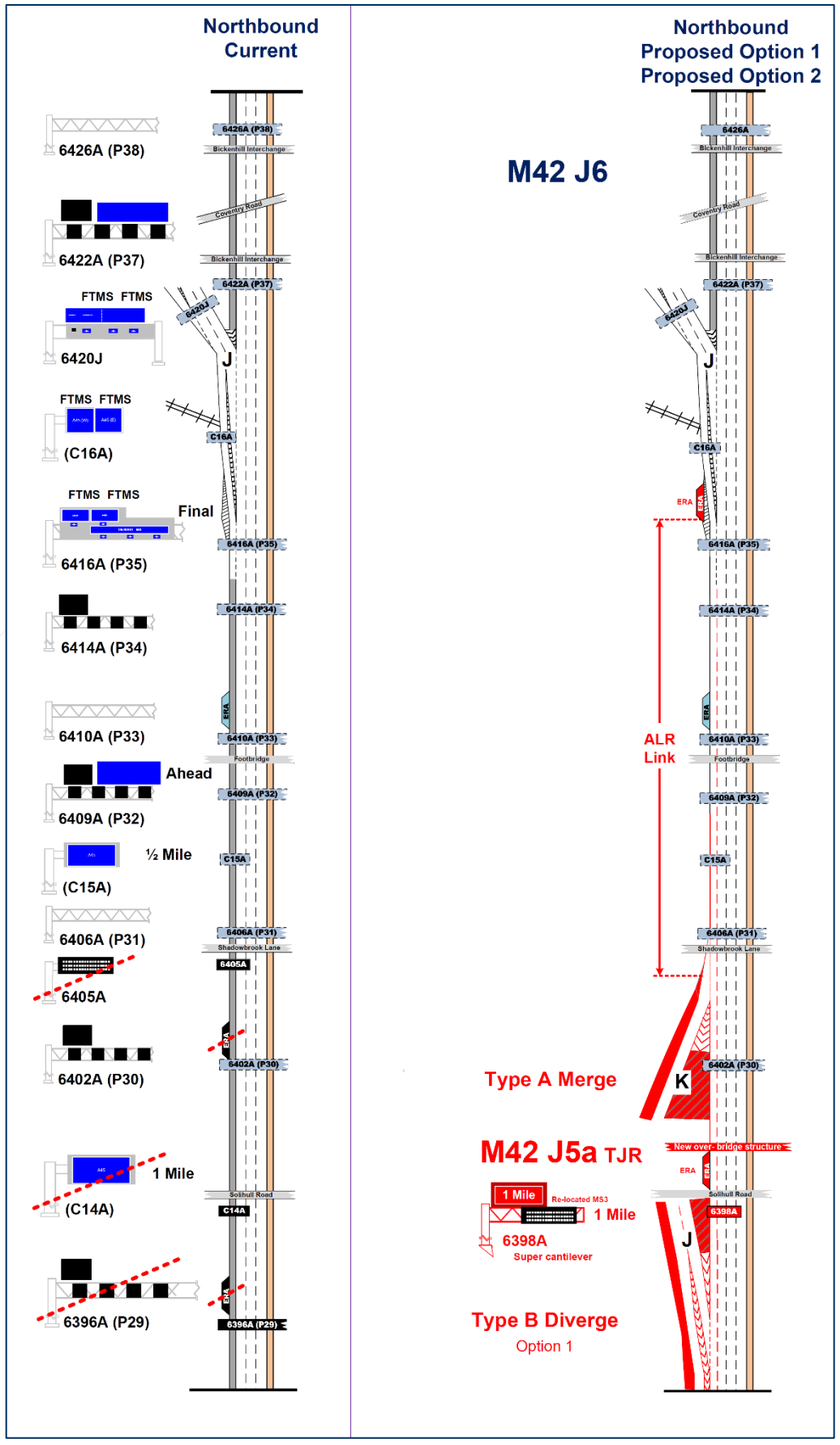
Option 1 and 2: M42 J6 to J7 Northbound

Gantry Ref	M42 J6 to J7 Northbound - Mainline Impact Summary (Option 1 and Option 2)
6458A (P52)	Unaffected – retain
6456A (P50A)	Unaffected – retain
6453A (P49)	Unaffected – retain
6451A (P48)	Unaffected – retain
6449A (P47)	Unaffected – retain
C19A	Unaffected – retain
6446A (P46)	Unaffected – retain
ERA	Unaffected – retain
6444A	Unaffected – retain
Remove - 6441A (P45)	AMIs and MS4 could be removed due to approx. 900m spacing between 6437AB and 6446A, subject to confirmation of inter-visibility at preliminary design PCF Stage 3
Reposition - 6437A	New strategic 3x18 MS3 relocated from 6437A – due to obscuration of 6437B (midpoint between 6437A and 1 mile ADS in accordance with IAN 111/09 Clause 9.10.1, however alternative location may need to be found due to approx. 200m spacing between 6437AB and 1 mile ADS
Upgrade - 6437AB (P44)	Utilise as new gateway gantry – add new 4x AMIs and MS4
Remove - 6434A (P43)	Existing gateway gantry to be removed due to signals proposed to be relocated to 6437A therefore the A carriageway boom becomes redundant. Might require relocation due to hard-shoulder starting further downstream / Highways to confirm if the tail nosing be cut short to remove carriageway widening under gantry.
Remove - ERA	ERA to be removed due to extended J6 NB merge
Remove - 6431A (P42)	Requires removal due to widening of southbound diverge. LBS1 lane closure could result in full closure of merge if nose is extended / could be made redundant due to no inter-visibility issues prior to 6437AB (inter-visibility needs checking) as distance between 6427A and 6437A is within IAN 111/09 permitted range of 600-1000m. If retention of AMIs and MS4s is required, they can be relocated to new gantry 6430A.
6427A (P40)	Unaffected – retain



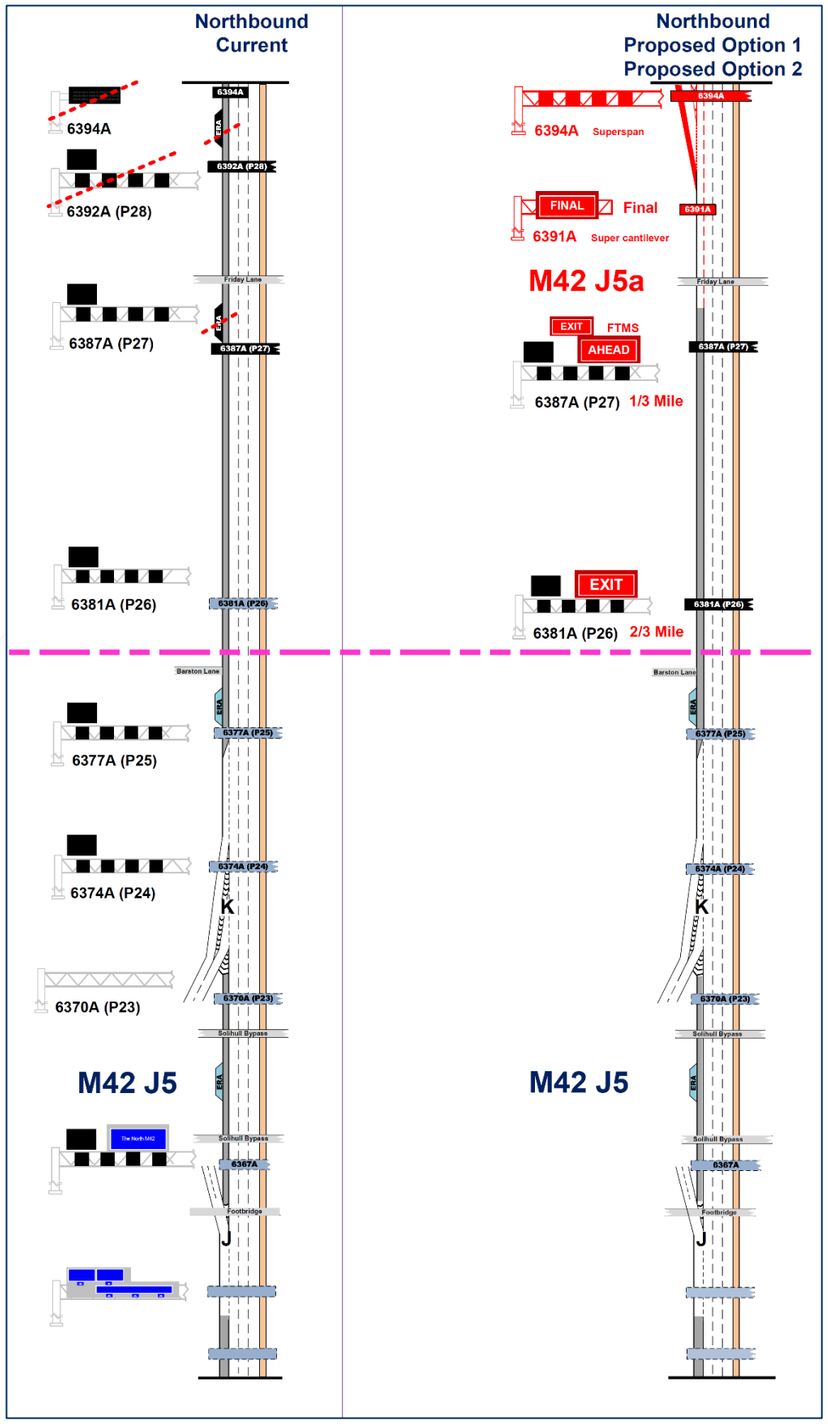
Option 1 and 2: M42 J5a to J6 Northbound

Gantry Ref	M42 J5a (new) to J6 Northbound - Mainline Impact Summary (Option 1 and Option 2)
6426A (P38)	Unaffected – retain
6422A (P37)	Unaffected – retain
6420J	Unaffected – retain
C16A	Unaffected – retain
New - ERA	New ERA (including ERT) required on J6 NB off-slip - refer to draft Major Projects Instruction: Update to Refuge Area Requirements in IAN161/15
6416A (P35)	Unaffected – retain
6414A (P34)	Unaffected – retain
6410A (P33)	Unaffected – retain
ERA	Unaffected – retain
6409A (P32)	Unaffected – retain
C15A	Unaffected – retain
6406A (P31)	Unaffected – retain
6405A	Unaffected – retain
6402A (P30)	Unaffected – retain
Remove - ERA	ERA removed due to new M42 J5a merge layout
Remove - C14A	Remove and relocate ADS to new super span portal / super cantilever
Reposition - 6398A	1/2 mile ADS relocated from existing cantilever together with associated 3x18 MS3 relocated from existing cantilever 6394A. (Note: DfS required for co-location of ADS and Strategic MS3)
New - ERA	New intra-junction ERA to be provided intra-junction within new M42 J5a
Remove - 6396A (P29)	Gantry removed due to new J5a merge and diverge widening
Remove - ERA	ERA removed due to new J5a diverge widening



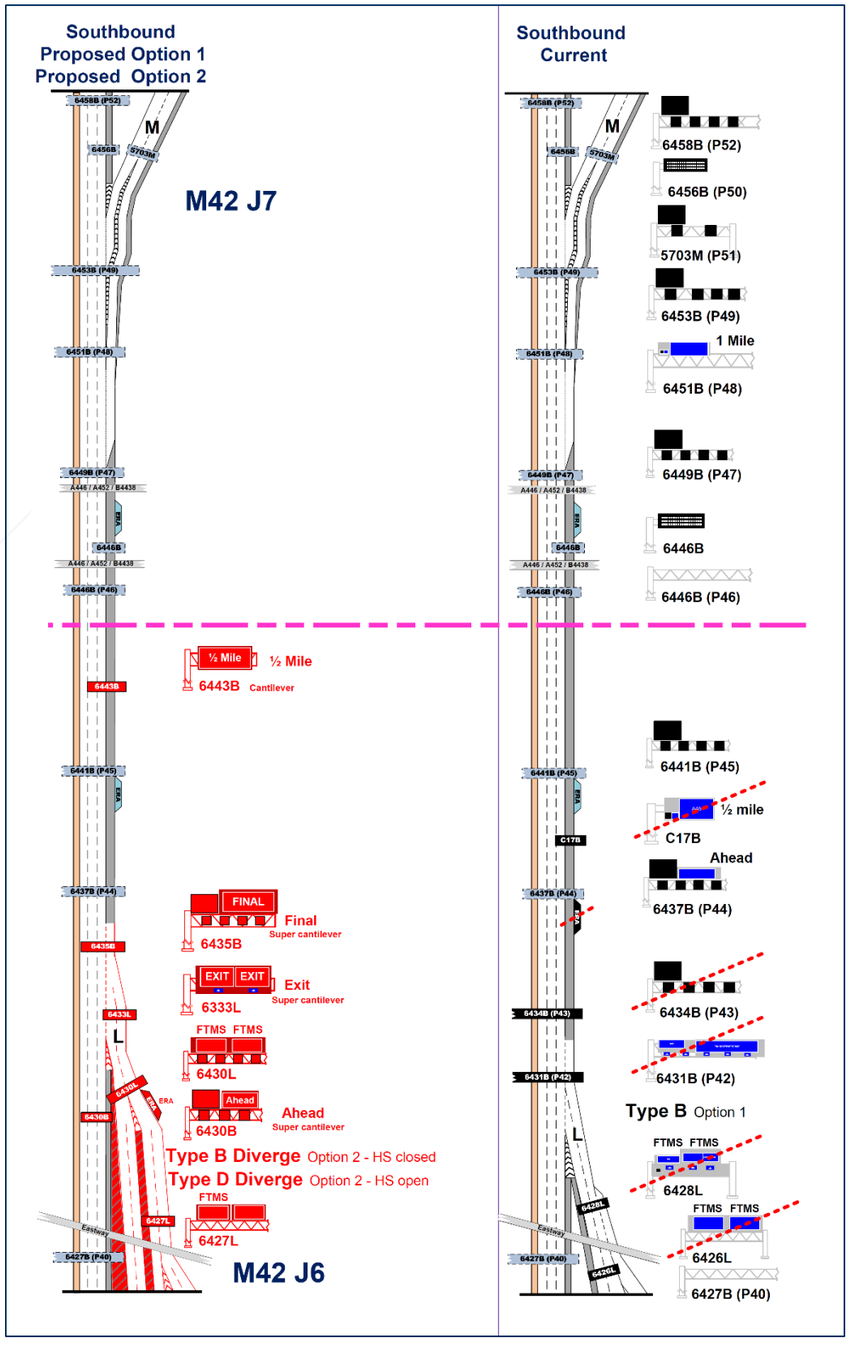
Option 1 and 2: M42 J5 to J5a Northbound

Gantry Ref	M42 J5 to J5a (new) Northbound - Mainline Impact Summary (Option 1 and Option 2)
Remove - 6394A	Removed due to new J5a northbound diverge construction - relocate to new gantry
New - 6394A	New infill gantry required due to removal of 6392AB and 6396AB (inter-visibility to be checked)
Remove - 6392A (P28)	Gantry removed to new J5a merge and diverge widening
New - 6391A	New super span portal (or super cantilever gantry) required for J5a Final ADS
Upgrade - 6387AB (P27)	1/3mile ADS (Exit & Ahead if required) incorporating TJR FTMS as required by IAN 112/08) for new M42 J5a added to existing AMI/MS4 gantry Retention of AMIs required to satisfy IAN 111 signal spacing requirements however removal of MS4 is recommended to allow ADS/FTMS installation and reduce information overload Departure will be required due to existing gantry being less than 515m from exit datum
Remove - ERA	ERA to be removed (including ERT) due to proximity to end of hard-shoulder at new J5a NB diverge
Upgrade - 6381A (P26)	2/3mile ADS (Exit & Ahead if required) for new M42 J5a added to existing AMI/MS4 gantry
6377A (P25)	Unaffected – retain
6374A	Unaffected – retain
6370A (P23)	Unaffected – retain



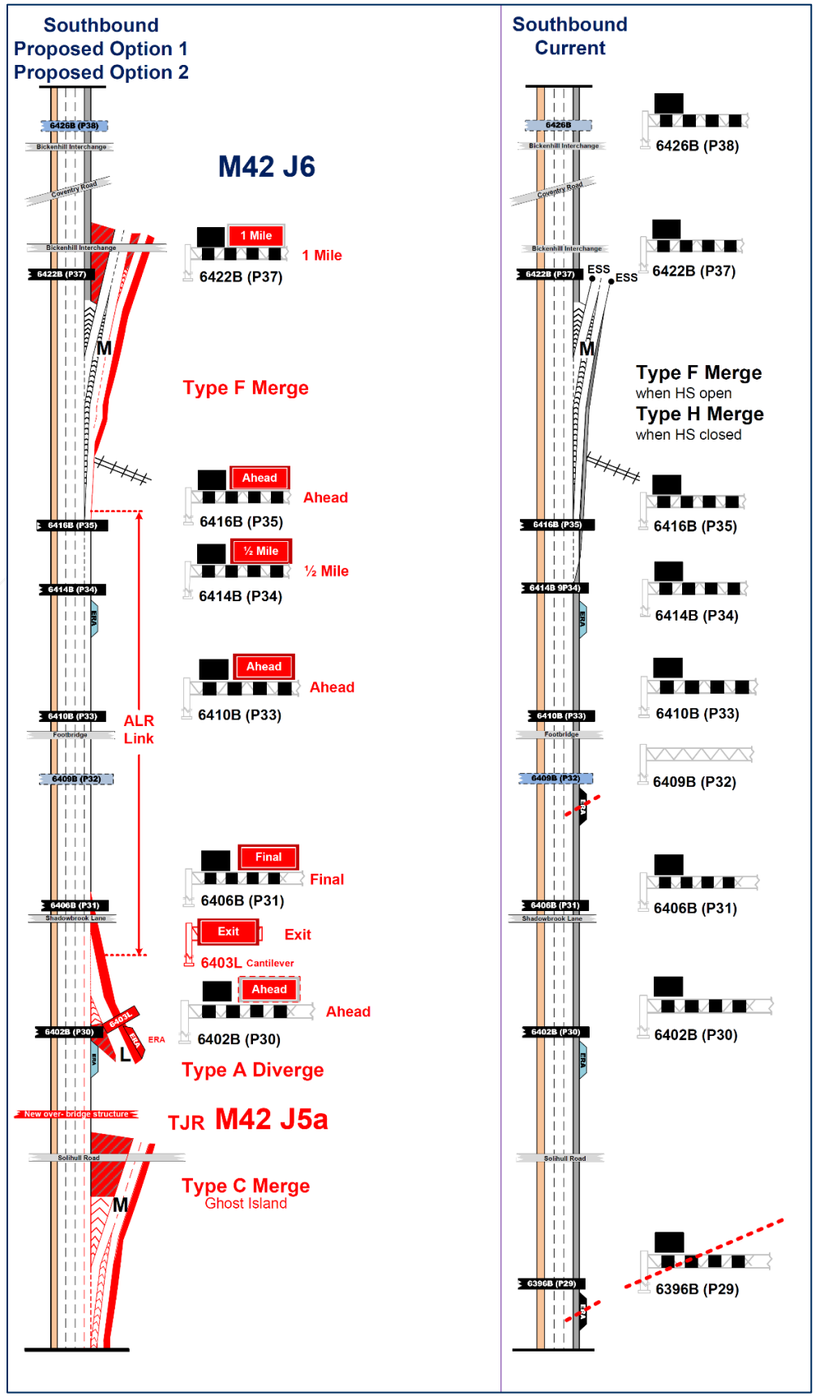
Option 1 and 2: M42 J7 to J6 Southbound

Gantry Ref	M42 J7 to J6 Southbound - Mainline Impact Summary (Option 1 and Option 2)
6458B	Unaffected – retain
6456B	Unaffected – retain
5703M (P51)	Unaffected – retain
6453B (P49)	Unaffected – retain
6451B (P48)	Unaffected – retain
6449B (P47)	Unaffected – retain
6446B	1 mile retain in current location - within TD46 tolerance of 300m +/- 100m upstream of new 1/2 mile ADS at 6443B
6446B (P46)	Unaffected – retain
New – 6443B	New 1/2 mile ADS required due to relocation of diverge datum. Opportunity to relocate to 6441B (DfS for substandard distance from datum required) if ahead signing is omitted. Existing cantilever structure from 6439B could potentially be reused.
6441B (P45)	Unaffected – retain
ERA	Unaffected - retain. Note: DfS with suitable mitigation will be required as ERA is downstream of 1/2 mile ADS
Remove - C17B	To be removed (possibly reused at 6443B - see below) due to relocation of exit datum.
6437AB (P44)	Unaffected – retain
New - 6435B	New final ADS gantry to replace 6431A - opportunity to use super cantilever as no equipment required on northbound carriageway or conventional cantilever if ahead signing is omitted
Remove - 6434A (P43)	Gantry will need to be removed due to diverge widening - additional gantry required at 6435B due to resultant excessive spacing between 6437B and 6426B
New - 6333L	New super cantilever added
Remove - 6431B	This will need to be removed with ADS transferred to the new Final ADS gantry 6435B
New - 6430L	New ADS gantry with FTMS in advance of A45 East / NEC & A45 West split
New - 6430B	Additional gantry required due to removal of 6431B and resultant excessive spacing between 6437B and 6426B No ERA to be provided due to restricted verge width between M42 SB carriageway and SB off-slip
Remove - 6428L (P41L)	Gantry removed due to slip road widening/reconfiguration
New - 6427L	New ADS gantry with FTMS in advance of NEC/A45 West split



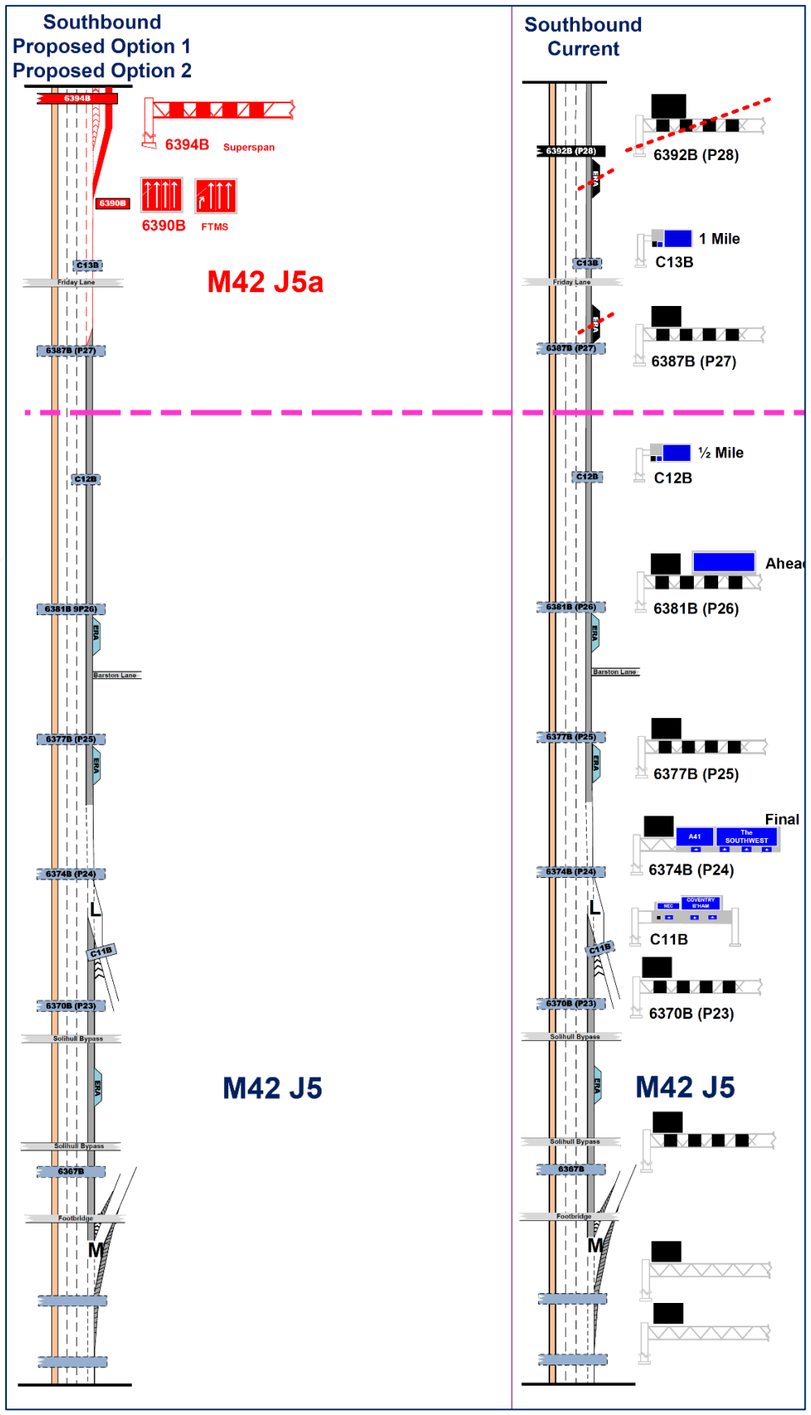
Option 1 and 2: M42 J6 to J5a Southbound

Gantry Ref	M42 J6 to J5a (new) Southbound - Mainline Impact Summary (Option 1 and Option 2)
6426B (P38)	Unaffected – retain
Upgrade - 6422B (P37)	1 mile ADS for new M42 J5a added to existing AMI/MS4 gantry
Upgrade - 6416B (P35)	Ahead signing for new M42 J5a added to existing AMI/MS4 gantry (not required for TJR however inclusion will simplify 1/2 mile ADS and link is ALR not HSR therefore FTMS with ahead signing is not required at 1/2 mile ADS)
Upgrade - 6414B (P34)	½ mile ADS added to existing AMI/MS4 gantry
ERA	Unaffected – retain. Note: DfS with suitable mitigation will be required as ERA is downstream of 1/2 mile ADS
Upgrade - 6410B (P33)	Ahead signing for new M42 J5a added to existing AMI/MS4 gantry
6409B (P32)	Unaffected – retain
Remove - ERA	ERA to be removed due to proximity to new M42 J5a SB diverge
Upgrade - 6406B (P31)	Final ADS for new J5a added to existing AMI/MS4 gantry AMIs and MS4s can be removed, subject to inter visibility check between 6410B and 6402B
New - 6403L	New cantilever ADS required at J5a SB exit in accordance with IAN 111, however as J5-5a is an ALR link, opportunity to omit
Upgrade - 6402B (P30)	(Optional) Ahead signing for new J5a added to existing AMI/MS4 gantry
ERA	ERA unaffected – retain
New - ERA	New ERA (including ERT) required on J5a SB off-slip - refer to draft MPI
Remove - 6396AB (P29)	Gantry removed due to new J5a merge and diverge widening
Remove - ERA	ERA (including ERT) removed due to new J5a merge and diverge widening



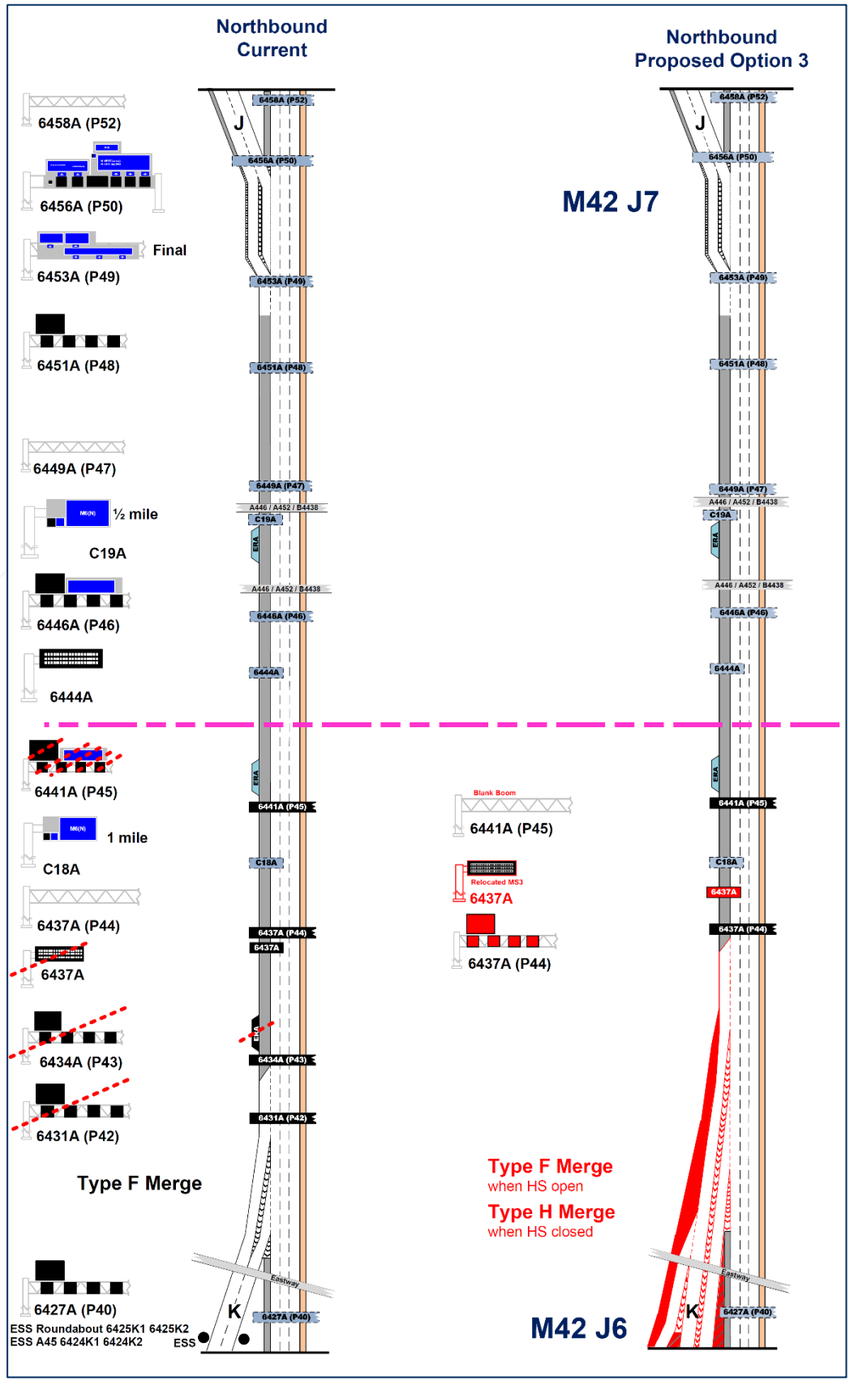
Option 1 and 2: M42 J5a to J5 Southbound

Gantry Ref	M42 J5a to J5 Southbound - Mainline Impact Summary (Option 1 and Option 2)
New - 6394B	New infill gantry required due to removal of 6392AB and 6396AB (inter-visibility to be checked) No ERA to be provided as gantry spans J5a SB merge
Remove - 6392B (P28)	Gantry removed due to new M42 J5a merge and diverge widening
Remove - ERA	ERA (including ERT) removed due to new M42 J5a merge and diverge widening
New - 6390B	Verge FTMS required for TJR merge - refer to IAN 112
C13B	Unaffected – retain
6387B (P27)	Unaffected – retain. First signal gantry on new J5a to 5 SB HSR link
Remove - ERA	ERA (including ERT) to be removed due to proximity to start of hard-shoulder
C12B	Unaffected – retain
6381B (P26)	Unaffected – retain
ERA	Unaffected – retain
6377B (P25)	Unaffected – retain
ERA	Unaffected – retain
6374B (P24)	Unaffected – retain
C11B	Unaffected – retain
6370B (P23)	Unaffected – retain



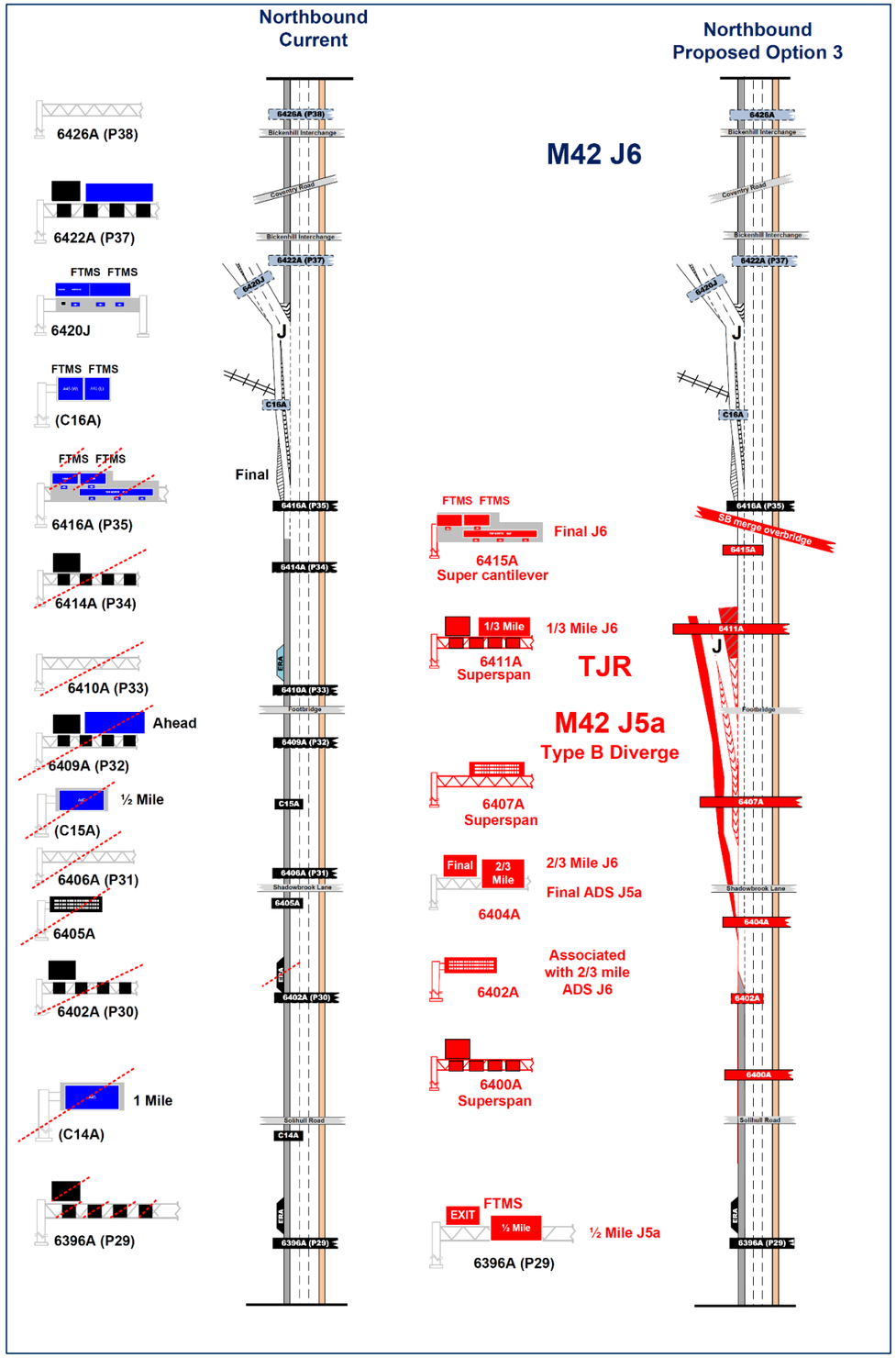
Option 3: M42 J6 to J7 Northbound

Gantry Ref	M42 J6 to J7 Northbound - Mainline Impact Summary (Option 3)
6458A (P52)	Unaffected – retain
6456A (P50A)	Unaffected – retain
6453A (P49)	Unaffected – retain
6451A (P48)	Unaffected – retain
6449A (P47)	Unaffected – retain
C19A	Unaffected – retain
6446A (P46)	Unaffected – retain
ERA	Unaffected – retain
6444A	Unaffected – retain
Remove - 6441A (P45)	AMIs and MS4 could be removed due to approx. 900m spacing between 6437AB and 6446A, subject to confirmation of inter-visibility at preliminary design PCF Stage 3
Reposition - 6437A	New strategic 3x18 MS3 relocated from 6437A – due to obscuration of 6437B (midpoint between 6437A and 1 mile ADS in accordance with IAN 111/09 Clause 9.10.1, however alternative location may need to be found due to approx. 200m spacing between 6437AB and 1 mile ADS
Upgrade - 6437AB (P44)	Utilise as new gateway gantry – add new 4x AMIs and MS4
Remove - 6434A (P43)	Existing gateway gantry to be removed due to signals proposed to be relocated to 6437A therefore the A carriageway boom becomes redundant. Might require relocation due to hard-shoulder starting further downstream / Highways to confirm if the tail nosing be cut short to remove carriageway widening under gantry.
Remove - ERA	ERA to be removed due to extended J6 NB merge
Remove - 6431A (P42)	Requires removal due to widening of southbound diverge. LBS1 lane closure could result in full closure of merge if nose is extended / could be made redundant due to no inter-visibility issues prior to 6437AB (inter-visibility needs checking) as distance between 6427A and 6437A is within IAN 111/09 permitted range of 600-1000m. If retention of AMIs and MS4s is required, they can be relocated to new gantry 6430.
6427A (P40)	Unaffected – retain
6458A (P52)	Unaffected – retain



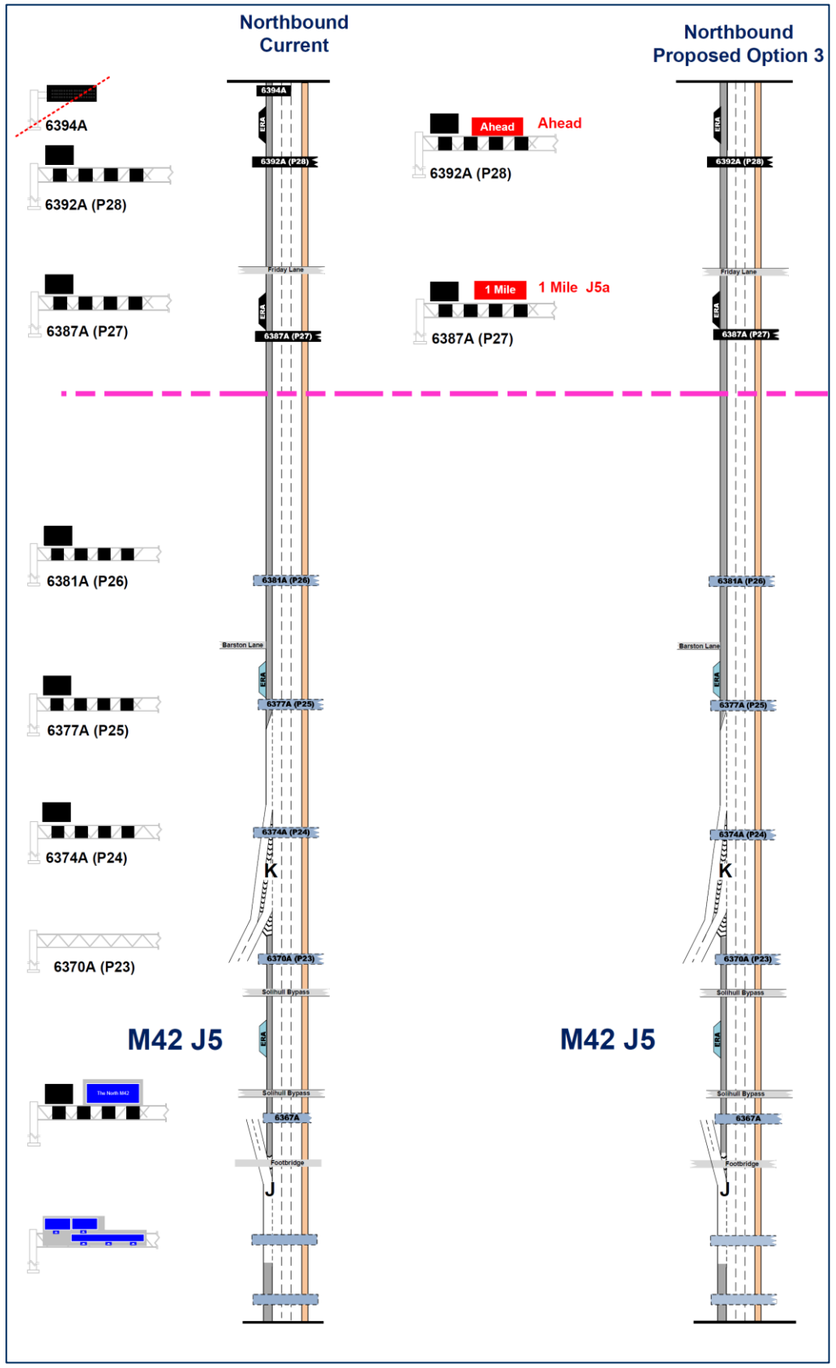
Option 3: M42 J5a to J6 Northbound

Gantry Ref	M42 J5a to J6 Northbound - Mainline Impact Summary (Option 3)
6426A (P38)	Unaffected – retain
6422A (P37)	Unaffected – retain
6420J	Unaffected – retain
C16A	Unaffected – retain
Remove - ERA	ERA to be removed
Remove - 6416A (P35)	Gantry to be removed
New - 6415A	New super cantilever to accommodate final ADS M42 J6 and 2x FTMS ADS
Remove - 6414A (P34)	Existing gantry to be removed – due to the inclusion of 6411A super span gantry
New - 6411A	New super span gantry to accommodate 1/3 mile ADS for M42 J6, MS4 and 4x AMIs
Remove -6410A (P33)	Existing gantry to be removed – due to the provision of the northbound diverge at M42 J5a
Remove - ERA	ERA to be removed
Remove - 6409A (P32)	Existing super span gantry to be removed – due to the provision of the northbound diverge at M42 J5a
New – 6407A	New super span gantry – to accommodate the re-located strategic 3x18 MS3
Remove - C15A	½ mile ADS to be removed – due to the provision of the northbound diverge at M42 J5a
Remove - 6406A (P31)	Blank boom to be removed – due to the provision of the northbound diverge at M42 J5a
New – 6404A	New super cantilever gantry – to accommodate final ADS for M42 J6 and 2/3 mile ADS for M42 J6
6405A	MS3 3x18 strategic sign to be removed – due to new junction layout and relocated at 6407A
Remove - 6402A (P30)	Remove gantry mounted MS4 and 4x AMIs
New - 6402A	New super cantilever gantry – to accommodate MS3 3x18
Remove - ERA	ERA to be removed
New – 6400A	New super cantilever gantry with MS4 and 4x AMIs
Remove - C14A	Remove and relocate ADS to new super span portal / super cantilever
Remove - 6396A (P29)	Remove existing MS4 and 4x Amis and replace with ½ mile ADS for M42 J5a and exit FTMS
Remove - ERA	ERA removed due to new J5a diverge widening



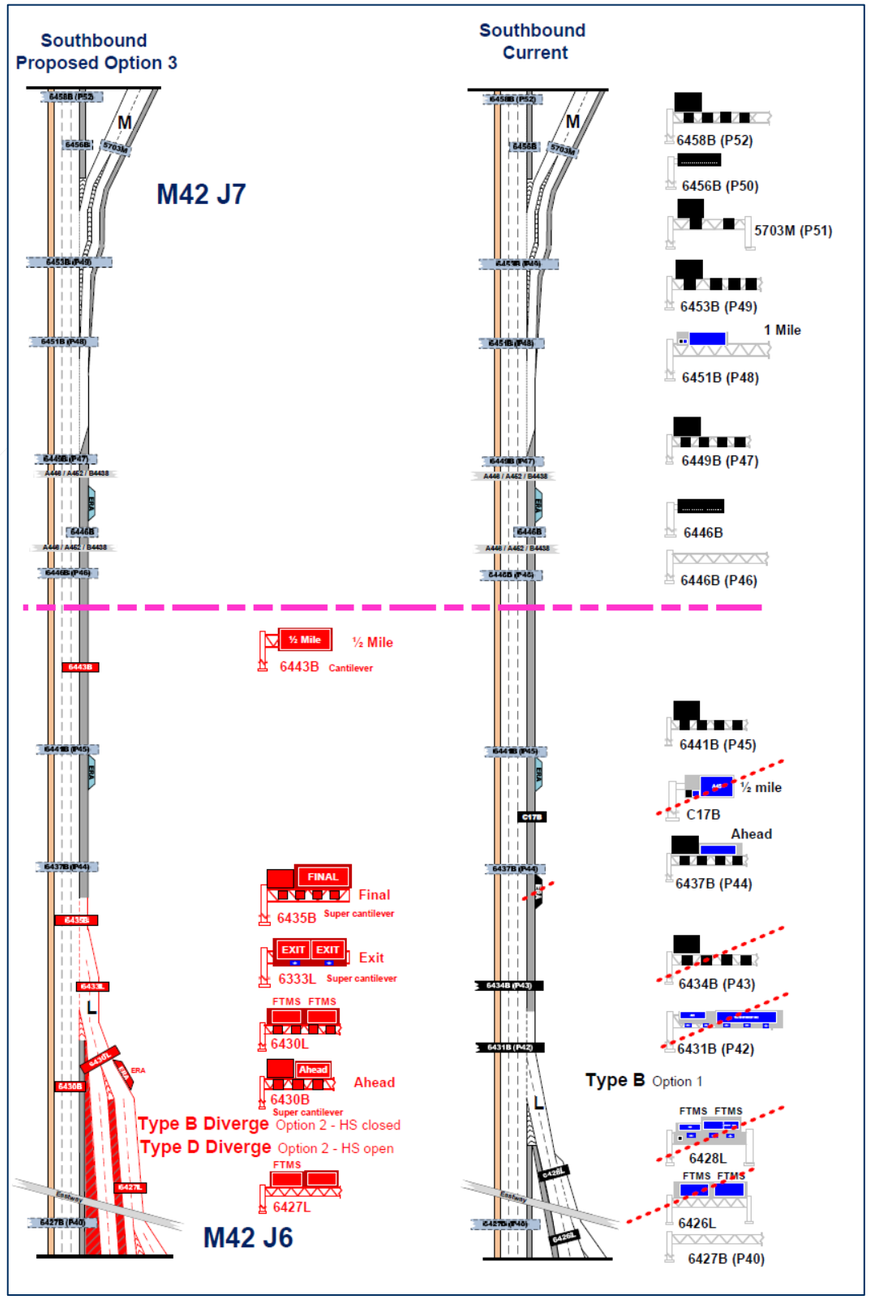
Option 3: M42 J5 to J5a Northbound

Gantry Ref	M42 J5 to J5a Northbound - Mainline Impact Summary (Option 3)
Remove - 6394A	MS3 3x18 strategic sign to be removed – replaced at 6420A
Upgrade - 6392A (P28)	Additional ADS ahead sign to be included
Upgrade - 6387A (P27)	1 mile ADS to be included for new M42 J5A
ERA	Unaffected – retain
6381A (P26)	Unaffected – retain
6377A (P25)	Unaffected – retain
6374A	Unaffected – retain
6370A (P23)	Unaffected – retain



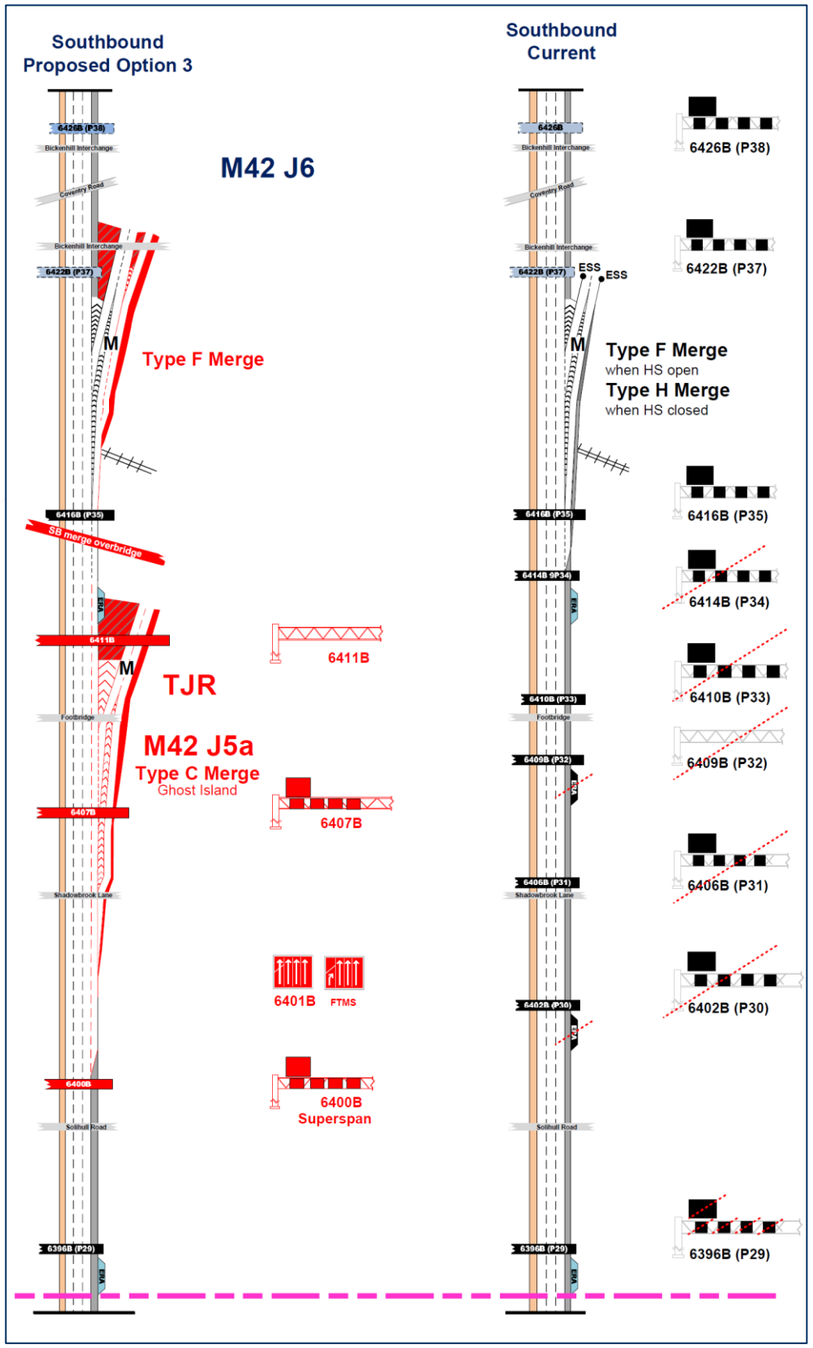
Option 3: M42 J7 to J6 Southbound

Gantry Ref	M42 J7 to J6 southbound - Mainline Impact Summary (Option 3)
6458B	Unaffected – retain
6456B	Unaffected – retain
5703M (P51)	Unaffected – retain
6453B (P49)	Unaffected – retain
6451B (P48)	Unaffected – retain
6449B (P47)	Unaffected – retain
6446B	1 mile retain in current location - within TD46 tolerance of 300m +/- 100m upstream of new 1/2 mile ADS at 6443B
6446B (P46)	Unaffected – retain
New – 6443B	New 1/2 mile ADS required due to relocation of diverge datum. Opportunity to relocate to 6441B (DfS for substandard distance from datum required) if ahead signing is omitted. Existing cantilever structure from 6439B could potentially be reused.
6441B (P45)	Unaffected – retain
ERA	Unaffected - retain. Note: DfS with suitable mitigation will be required as ERA is downstream of 1/2 mile ADS
Remove - C17B	To be removed (possibly reused at 6443B - see below) due to relocation of exit datum.
6437AB (P44)	Unaffected – retain
New - 6435B	New final ADS gantry to replace 6431A - opportunity to use super cantilever as no equipment required on northbound carriageway or conventional cantilever if ahead signing is omitted
Remove - 6434A (P43)	Gantry will need to be removed due to diverge widening - additional gantry required at 6435B due to resultant excessive spacing between 6437B and 6426B
New - 6333L	New super cantilever added
Remove - 6431B	This will need to be removed with ADS transferred to the new Final ADS gantry 6435B
New - 6430L	New ADS gantry with FTMS in advance of A45 East / NEC & A45 West split
New - 6430B	Additional gantry required due to removal of 6431B and resultant excessive spacing between 6437B and 6426B No ERA to be provided due to restricted verge width between M42 SB carriageway and SB off-slip
Remove - 6428L (P41L)	Gantry removed due to slip road widening/reconfiguration



Option 3: M42 J7 to J6 Southbound

Gantry Ref	M42 J7 to J6 southbound - Mainline Impact Summary (Option 3)
6426B (P38)	Unaffected – retain
6422B (P37)	Unaffected – retain
6416B (P35)	Unaffected – retain
Remove - 6414B (P34)	Super span gantry to be removed – due to proposed junction layout
ERA	Unaffected – retain
Remove - 6410B (P33)	Super span gantry to be removed – due to proposed junction layout
Remove - 6409B (P32)	Super span gantry to be removed – due to proposed junction layout
Remove - ERA	ERA to be removed due to proximity to new M42 J5a SB merge
New - 6406B	New super span gantry to be included with MS4 and 4x AMIs
Remove - 6406B (P31)	Super span gantry to be removed – due to proposed junction layout
Remove - 6402B (P30)	Super span gantry to be removed – due to proposed junction layout
New - 6400B	New super span gantry to be included with MS4 and 4x AMIs
Remove - ERA	ERA to be removed due to proximity to new M42 J5a
Remove - 6396B (P29)	MS4 and 4x AMIs to be removed
ERA	Unaffected – retain



Option 3: M42 J7 to J6 Southbound

Gantry Ref	M42 J7 to J6 southbound - Mainline Impact Summary (Option 3)
New - 6392B	Unaffected – retain
C13B	Unaffected – retain
ERA	Unaffected – retain
6387B (P27)	Unaffected – retain
C12B	Unaffected – retain
6381B (P26)	Unaffected – retain
ERA	Unaffected – retain
6377B (P25)	Unaffected – retain
ERA	Unaffected – retain
6374B (P24)	Unaffected – retain
C11B	Unaffected – retain
6370B (P23)	Unaffected – retain