



# **M42 Junction 6 Improvement Scheme**

**PCF Stage 3 Preliminary Environmental  
Information Report**

**Report Number: HE551485-ACM-EGN-ZZ-SW-ZZ-ZZ-RP-LE-0002-P01 S4  
January 2018**

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January 2018

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Standard codes for suitability models and documents See BS1192:2007 Table 5 for further details					
Revision	Status	Description	Revision	Status	Description
P01.01 etc. to P0n.01 etc.	S0	Initial status or WIP	P01.1 etc. to Pn.1 etc.	D1	Costing
P01.01 to P0n.01	S1	Co-ordination	P01.1 etc. to Pn.1 etc.	D2	Tender
P01 to Pnn	S2	Information	P01.1 etc. to Pn.1 etc.	D3	Contractor Design
P01 to Pnn	S3	Review & Comment	P01.1 etc. to Pn.1 etc.	D4	Manufacture/ Procurement
P01 to Pnn	S4	Stage Approval	C01 to C0n	A1, A2 etc	Approved and accepted as stage complete
P01 to Pnn	S5	Manufacture	P01.01 etc. to P0n.0n etc.	B1, B2 etc	Partially signed-off:
P01 to Pnn	S6	PIM Authorization	C01 to C0n	CR	As Construction Record
P01 to Pnn	S7	AIM Authorization			

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## Contents

<b>1.</b>	<b>INTRODUCTION.....</b>	<b>1</b>
1.1.	Introduction .....	1
1.2.	Overview and Need for the Proposed Scheme .....	1
1.3.	Highways England Major Project Delivery Protocol.....	2
1.4.	The Purpose of the Report.....	3
1.5.	Planning Inspectorate Formal Scoping Opinion Response .....	4
1.6.	Legislative and Policy Framework .....	4
1.7.	The Overseeing Organisation .....	6
1.8.	The Designer.....	6
1.9.	Stakeholder Engagement .....	6
1.10.	Structure of this PEI Report .....	8
1.11.	Next Steps.....	9
<b>2.</b>	<b>THE PROPOSED SCHEME .....</b>	<b>10</b>
2.1.	Project Objectives .....	10
2.2.	Project Location .....	10
2.3.	Description of the Proposed Scheme .....	12
2.4.	Construction, Operation and Long Term Management .....	13
<b>3.</b>	<b>ASSESSMENT OF ALTERNATIVES.....</b>	<b>16</b>
3.1.	Scheme History.....	16
3.2.	Selection of the Proposed Scheme.....	16
3.3.	Development of the Proposed Scheme .....	27
3.4.	Iterative Design .....	28
<b>4.</b>	<b>ENVIRONMENTAL ASSESSMENT METHODOLOGY .....</b>	<b>29</b>
4.1.	General Approach .....	29
4.2.	Existing Baseline and Future Conditions .....	29
4.3.	Potential Significant effects and Mitigation .....	31
<b>5.</b>	<b>AIR QUALITY .....</b>	<b>35</b>
5.1.	Introduction .....	35
5.2.	Stakeholder Engagement .....	35
5.3.	Assessment Assumptions and Limitations.....	35
5.4.	Study Area .....	36
5.5.	Baseline Conditions .....	36
5.6.	Potential Impacts.....	41
5.7.	Design, Mitigation and Enhancement Measures .....	43
5.8.	Assessment of Effects.....	48
<b>6.</b>	<b>CULTURAL HERITAGE .....</b>	<b>49</b>
6.1.	Introduction .....	49
6.2.	Stakeholder Engagement .....	49
6.3.	Assessment Assumptions and Limitations.....	49
6.4.	Study Area .....	49
6.5.	Baseline Conditions .....	50

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6.6.	Potential Impacts.....	56
6.7.	Design, Mitigation and Enhancement Measures .....	59
6.8.	Assessment of Effects.....	60
<b>7.</b>	<b>LANDSCAPE.....</b>	<b>62</b>
7.1.	Introduction .....	62
7.2.	Stakeholder Engagement .....	62
7.3.	Assessment Assumptions and Limitations.....	63
7.4.	Study Area .....	63
7.5.	Baseline Conditions .....	63
7.6.	Potential Impacts.....	66
7.7.	Design, Mitigation and Enhancement Measures .....	71
7.8.	Assessment of Effects.....	72
<b>8.</b>	<b>BIODIVERSITY.....</b>	<b>74</b>
8.1.	Introduction .....	74
8.2.	Stakeholder Engagement .....	74
8.3.	Assessment Assumptions and Limitations.....	75
8.4.	Study Area .....	75
8.5.	Baseline Conditions .....	76
8.6.	Potential Impacts.....	90
8.7.	Design, Mitigation and Enhancement Measures .....	98
8.8.	Assessment of Effects.....	102
<b>9.</b>	<b>SOILS, GEOLOGY AND GROUNDWATER.....</b>	<b>103</b>
9.2.	Stakeholder Engagement .....	104
9.3.	Assessment Assumptions and Limitations.....	104
9.4.	Study Area .....	104
9.5.	Baseline Conditions .....	105
9.6.	Potential Impacts.....	116
9.7.	Design, Mitigation and Enhancement Measures .....	117
9.8.	Assessment of Effects.....	118
<b>10.</b>	<b>MATERIALS.....</b>	<b>119</b>
10.1.	Introduction .....	119
10.2.	Stakeholder Engagement .....	119
10.3.	Assessment Assumptions and Limitations.....	120
10.4.	Study Area .....	120
10.5.	Baseline Conditions .....	120
10.6.	Potential Impacts.....	121
10.7.	Design, Mitigation and Enhancement Measures .....	123
10.8.	Assessment of Effects.....	123
<b>11.</b>	<b>NOISE AND VIBRATION.....</b>	<b>124</b>
11.1.	Introduction .....	124
11.2.	Stakeholder Engagement .....	124
11.3.	Assessment Assumptions and Limitations.....	124
11.4.	Study Area .....	125

---

11.5.	Baseline Conditions .....	126
11.6.	Potential Impacts.....	128
11.7.	Design, Mitigation and Enhancement Measures .....	131
11.8.	Assessment of Effects.....	133
<b>12.</b>	<b>PEOPLE AND COMMUNITIES .....</b>	<b>134</b>
12.1.	Introduction .....	134
12.2.	Stakeholder Engagement .....	134
12.3.	Assessment Assumptions and Limitations.....	135
12.4.	Study Area .....	135
12.5.	Baseline Conditions .....	136
12.6.	Potential Impacts.....	140
12.7.	Design, Mitigation and Enhancement Measures .....	143
12.8.	Assessment of Effects.....	144
<b>13.</b>	<b>ROAD DRAINAGE AND WATER ENVIRONMENT .....</b>	<b>145</b>
13.1.	Introduction .....	145
13.2.	Stakeholder Engagement .....	145
13.3.	Assessment Assumptions and Limitations.....	145
13.4.	Study Area .....	145
13.5.	Baseline Conditions .....	146
13.6.	Potential Impacts.....	152
13.7.	Design, Mitigation and Enhancement Measures .....	153
13.8.	Assessment of Effects.....	155
<b>14.</b>	<b>CLIMATE .....</b>	<b>161</b>
14.1.	Introduction .....	161
14.2.	Stakeholder Engagement .....	161
14.3.	Assessment Assumptions and Limitations.....	161
14.4.	Study Area .....	162
14.5.	Baseline Conditions .....	162
14.6.	Potential Impacts.....	163
14.7.	Design, Mitigation and Enhancement Measures .....	164
14.8.	Assessment of Effects.....	165
<b>15.</b>	<b>ASSESSMENT OF CUMULATIVE EFFECTS .....</b>	<b>166</b>
15.1.	Cumulative Assessment Methodology.....	166
15.2.	Assessment of Effects.....	168
15.3.	Next Steps.....	170
<b>16.</b>	<b>GLOSSARY AND ABBREVIATIONS .....</b>	<b>171</b>
16.1.	Glossary .....	171
16.2.	Abbreviations .....	191
<b>17.</b>	<b>APPENDICES.....</b>	<b>194</b>
<b>18.</b>	<b>LOCATION AND DESIGN PLANS .....</b>	<b>195</b>



# 1. INTRODUCTION

## 1.1. Introduction

- 1.1.1. This Preliminary Environmental Information (PEI) Report has been prepared as part of the pre-application consultation on Highways England's proposals to implement improvements to Junction 6 of the M42 motorway near Solihull, in Birmingham (hereafter referred to as the "proposed scheme") (See Figure 1.1).
- 1.1.2. The PEI Report sets out the preliminary findings of studies being undertaken regarding the assessment of potential environmental effects associated with the proposed scheme.
- 1.1.3. Given that the proposed scheme is a Nationally Significant Infrastructure Project (NSIP<sup>1</sup>), Highways England intends to make an application for a Development Consent Order (DCO) to the Planning Inspectorate under the Planning Act 2008 (as amended). The Planning Inspectorate will examine the application and provide advice and a report to the Secretary of State, who will determine the application.

## 1.2. Overview and Need for the Proposed Scheme

- 1.2.1. AECOM Infrastructure and Environment UK Ltd (AECOM) has been commissioned by Highways England to provide design services for the development of the proposed scheme.
- 1.2.2. The proposed scheme would provide connections between the national motorway network, and A45 Coventry Road which provides strategic access to Birmingham to the west, and Coventry to the east. Junction 6 lies on the eastern edge of Birmingham, approximately nine miles from the city centre, with the nearest town being Solihull.
- 1.2.3. The proposed scheme includes the following five main elements:
- A new dumbbell junction approximately 1.8km south of the existing Junction 6 off the M42;
  - The construction of a new 2.4km dual carriageway link road between the new junction and Clock Interchange (an existing junction on the A45);
  - Modifications to the existing Clock Interchange junction;
  - Upgrades to the existing Junction 6; and
  - Realignment and improvements to local roads to the west of the existing M42 in proximity to the proposed bypass.
- 1.2.4. The 'Road Investment Strategy: for the 2015/16 - 2019/20 Road Period' (RIS1)<sup>2</sup>, published 12/03/2015, indicated the proposed scheme as a committed new scheme first announced in the Autumn Statement 2014 (AS14), stating that the M42 Junction 6 scheme is 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<sup>3</sup> station.*"
- 1.2.5. The Highways England 'Delivery Plan 2015-2020' (published 26/03/2015) states that Highways England "*will be developing the options in more detail and preparing the scheme for public consultation in 2016, this will take into account planned station*

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<sup>1</sup> as defined in Section 14(1)(h) and 22(4) of the Planning Act 2008 (as amended)

<sup>2</sup> [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/408514/ris-for-2015-16-road-period-web-version.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/408514/ris-for-2015-16-road-period-web-version.pdf)

<sup>3</sup> <https://www.gov.uk/government/organisations/high-speed-two-limited>



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*developments linked to High Speed 2." It also stated that Highways England "anticipate being able to recommend a preferred route in early 2017. We are planning to start construction in 2020."*

- 1.2.6. The proposed scheme forms part of a much larger Government/HS2 Growth Strategy being developed with local partners to maximise the economic benefits of HS2.
- 1.2.7. The proposed scheme would help facilitate significant economic growth in the area, given that it would lie at the heart of an area of dynamic growth, surrounded by a unique mix of existing and proposed major assets serving both the local and wider economy. Junction 6 is the gateway to Birmingham Airport, Birmingham International Network Rail Station, the Birmingham National Exhibition Centre (NEC), the National Motorcycle Museum and National Conference Centre, Birmingham Business Park and Jaguar Land Rover (JLR).
- 1.2.8. In addition to the committed growth in the area, HS2's Birmingham Interchange station is anticipated to be operational by 2026, and Solihull Metropolitan Borough Council (SMBC) has ambitious plans to accommodate mixed use development at the UK Central Hub area (UKC)<sup>4</sup>. Collectively these developments will continue to add significant demand to the highway network and increase dependence on Junction 6.
- 1.2.9. Current congestion and journey reliability issues on the M42 and at Junction 6 present a significant constraint to future investment and economic growth. Without infrastructure investment to improve Junction 6, a major investment opportunity of national significance could be lost.
- 1.2.10. As an NSIP, the proposed scheme is being subject to formal Environmental Impact Assessment (EIA) procedures, as set out within The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (hereafter the 'EIA Regulations'), because it:
- is listed within Schedule 2 Regulation 3(1) Part 10 (f) Construction of roads; and
  - has the potential to generate significant environmental effects by virtue of its nature, scale and location.
- 1.2.11. An Environmental Statement (ES) presenting the findings of the EIA process will be submitted as part of the DCO application to the Planning Inspectorate.

### **1.3. Highways England Major Project Delivery Protocol**

- 1.3.1. Highways England follows a Project Control Framework<sup>5</sup> (PCF) to deliver major infrastructure projects, such as the proposed scheme. The PCF comprises:
- i) a standard project lifecycle;
  - ii) standard project deliverables;
  - iii) project control processes; and
  - iv) governance arrangements.
- 1.3.2. All major road projects are progressed through the PCF which is split into seven discrete phases as illustrated in Table 1.1.

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<sup>4</sup> The Urban Growth Company (UGC) a new delivery vehicle formed by SMBC to oversee the investment into the UK Central Hub area (UKC), (previously known as the M42 Economic Gateway. The UGC role is to promote, lead and develop major infrastructure investment within the UKC to facilitate wider development within the Solihull / West Midlands geographic area.

<sup>5</sup> <http://assets.highways.gov.uk/our-road-network/managing-our-roads/project-control-framework/The%20project%20control%20framework%20handbook%20v2%20April%202013.pdf>

**Table 1.1: Major Projects Lifecycle According to the Highways England PCF**



1.3.3. The Preferred Route Announcement (PRA) for the proposed scheme occurred on 7 August 2017 bringing an end to PCF Stage 2. The proposed scheme is now at PCF Stage 3 which, for NSIP highway schemes, entails the preparation of the draft Planning Act 2008 DCO application and the preparation of an ES reporting the outcomes of the EIA process.

#### 1.4. The Purpose of the Report

1.4.1. This PEI Report presents the current known potential impacts and effects of the proposed scheme on identified environmental receptors. It is for the purpose of informing statutory and non-consultees to facilitate discussion and feedback and also provide clarity of the status and overall delivery of the project.

1.4.2. Following the identification of potential impacts and effects, the PEI Report discusses the range of potential and likely impacts and effects using the information and data collected to date. It then proposes mitigation measures to reduce all effects. In the event significant effects are generated, further additional mitigation will be proposed to reduce these significant effects to levels deemed acceptable.

1.4.3. The EIA process is designed to be capable of, and sensitive to, changes that occur as a result of changes to the proposed scheme design, including any mitigation measures that are incorporated during the EIA. This will be particularly important for the proposed scheme as the design and layout is still being refined, and minor changes are likely to be made following the distribution of this PEI Report for statutory consultation, which may result in amendments to the extents of the application site boundary taking into consideration consultation responses and an evolving scheme design. The ES will report the potential impacts and effects of the proposed scheme being taken forward as part of the DCO application.

1.4.4. The content and detail of a PEI Report can vary depending on the stage at which pre-application consultation is being carried out, who the target audiences are, and the complexity of the receiving environment. This PEI Report has been compiled by Highways England to fulfil their statutory pre-application consultation duties, and comprises the information referred to in Part 1 of Schedule 4 of the EIA Regulations which is reasonably required to assess the potential environmental effects of the proposed scheme.

1.4.5. Accordingly, this PEI Report: presents the main environmental information collected to date by Highways England as part of the EIA process; provides a preliminary indication of the likely environmental impacts and effects of the proposed scheme; and details the potential measures envisaged to be necessary to mitigate potential effects.

1.4.6. This PEI Report has been prepared at a point in the proposed scheme design and assessment process to provide the general public and stakeholders with an understanding of the key environmental issues, whilst providing an opportunity to

prepare well-informed pre-application consultation responses on the design of the proposed scheme design and the EIA. Responses made by consultees will be considered and addressed as necessary prior to the proposed scheme design being finalised.

- 1.4.7. The information presented within this PEI Report is preliminary, and reflects environmental assessments undertaken at an early stage in the development of the proposed scheme design (see Chapter 2 – The Proposed Scheme). The EIA is being undertaken iteratively with the design-development process, the scope of which was set out in the M42 Junction 6 Improvements EIA Scoping Report which can be found at:

<https://infrastructure.planninginspectorate.gov.uk/projects/west-midlands/m42-junction-6-improvement/?ipcsection=docs>

## **1.5. Planning Inspectorate Formal Scoping Opinion Response**

- 1.5.1. Subsequently the scoping report was consulted upon with the Planning Inspectorate by way of a request for a formal Scoping Opinion. An opinion on the scope of the environmental assessment was provided by the Planning Inspectorate on the 1<sup>st</sup> December 2017 and can be found at:

<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010027/TR010027-000013-42J6%20-%20Scoping%20Opinion.pdf>

- 1.5.2. Highways England acknowledges the comments of The Inspectorate given within the Scoping Opinion and also notes the comments provided by the statutory consultees to The Inspectorate in Appendix 2 of the Scoping Opinion along with the late consultation response published on 30th November. The Scoping Opinion and the comments from the consultees will be considered in completing the EIA and preparing the ES.
- 1.5.3. Highways England will maintain ongoing dialogue with the Inspectorate and the applicable statutory consultees in relation to the scope of EIA in order to ensure that the scope of the EIA is proportionate and meets the requirements of the EIA Regulations.

## **1.6. Legislative and Policy Framework**

### **Planning Act 2008**

- 1.6.1. The proposed scheme is defined as a NSIP under Section 14(1)(h) and Section 22 of the Planning Act 2008 (PA 2008) (as amended by The Highway and Railway (Nationally Significant Infrastructure Project) Order 2013) by virtue of the fact that:
- It comprises the construction of a highway;
  - The highway to be constructed is wholly in England;
  - The Secretary of State is the highway authority for the highway; and
  - The speed limit for any class of vehicle on the highway is to be 50 miles per hour or greater, and the area for the construction of the highway is greater than 12.5 hectares.
- 1.6.2. In accordance with the legislation, a DCO is required to allow the construction and operation of the proposed scheme.

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### The EIA Regulations

- 1.6.3. The proposed scheme is considered to be 'EIA development' and specifically Schedule 2 development and will therefore be subject to an EIA, and reported within an ES. The proposed scheme is Schedule 2 development as it satisfies Clause 10 (f) of Schedule 2 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) on the basis that it is "*Construction of roads*".
- 1.6.4. In accordance with Regulation 8(1)(b) of the EIA Regulations, Highways England has notified the Secretary of State for Transport (Secretary of State) in a letter to the Planning Inspectorate that an ES presenting the findings of the EIA will be submitted with the DCO application.
- 1.6.5. An EIA Scoping Report was submitted to the Planning Inspectorate on 25<sup>th</sup> October 2017. The Planning Inspectorate reviewed and consulted on the EIA Scoping Report and issued a Scoping Opinion on 01<sup>st</sup> December 2017. This Scoping Opinion will be considered in completing the EIA and preparing the ES.

### The Decision Maker and Planning Policy

- 1.6.6. The Localism Act 2011, appointed the Planning Inspectorate as the agency responsible for operating the DCO process for NSIPs. In its role, the Planning Inspectorate will examine the application for the proposed scheme and then will make a recommendation to the Secretary of State who will then decide whether to grant a DCO.
- 1.6.7. In accordance with section 104(2) of the PA 2008, the Secretary of State is required to have regard to the relevant National Policy Statement (NPS), amongst other matters, when deciding whether or not to grant a DCO. The relevant NPS for the proposed scheme is the National Networks National Policy Statement (NPSNN)<sup>6</sup>.
- 1.6.8. The Secretary of State would also consider other important and relevant national and local planning policy, namely the National Planning Policy Framework (NPPF)<sup>7</sup> published in March 2012. The local planning policy relevant to the proposed scheme consists of the following adopted plan:
- Solihull Metropolitan Borough Council (SMBC) Local Plan (2013)<sup>8</sup>.
- 1.6.9. The EIA Scoping Report submitted to the Planning Inspectorate described the national and local planning policies relevant to the assessment with a summary provided for each environmental topic - these policies will be restated in the ES, however the ES will not include an policy compliance assessment. As such, the purpose of considering relevant planning policy during the EIA is twofold:
- To identify policy that could influence the sensitivity of receptors (and therefore the significance of effects) and any requirements for mitigation; and
  - To identify planning policy that could influence the methodology of the EIA. For example, a planning policy may require the assessment of a particular impact.

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<sup>6</sup> <https://www.gov.uk/government/collections/national-networks-national-policy-statement>

<sup>7</sup> <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

<sup>8</sup> <http://www.solihull.gov.uk/Resident/Planning/appealsenforcement/planmaking/ldf/localplan>

## 1.7. The Overseeing Organisation

1.7.1. The Overseeing Organisation is Highways England, The Cube, 199 Wharfside Street, Birmingham. Highways England has been consulted during all stages of the proposed scheme design process to ensure that both the approach and level of assessment as detailed herein are appropriate. As the Overseeing Organisation, Highways England defines the proposed scheme objectives.

## 1.8. The Designer

1.8.1. The designer for the proposed scheme is AECOM, Royal Court, Basil Close, Chesterfield, Derbyshire, S41 7SL. The role of the designer includes preparation of the proposed scheme design, environmental assessment, stakeholder consultation and preparation of the DCO application to the Planning Inspectorate.

1.8.2. EIA Directive (2014/52/EU) as transposed by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017<sup>9</sup> states that in order to ensure the completeness and quality of an ES:

- a) The applicant must ensure that the ES is prepared by competent experts; and
- b) The ES must be accompanied by a statement from the applicant outlining the relevant expertise or qualifications of such experts.

1.8.3. With regard to the environmental support to the proposed scheme, AECOM has a large multidisciplinary environmental team with appropriately qualified discipline leads across the various subjects as detailed within this PEI Report. In addition, the Environment Lead is a full member of the Institute of Environmental Sciences (IES) and a Chartered Environmentalist (CEnv). Thus it is considered that the requirements of para. 1.6.2 are being complied with.

## 1.9. Stakeholder Engagement

1.9.1. Consultation is a critical element of the DCO application process, and to date a range of consultation, both statutory and non-statutory has been undertaken. Consultation for the project commenced in PCF Stage 2 where a range of options were still being explored and considered (refer to Chapter 3: Assessment of Alternatives), and will continue into PCF Stage 3 through to the submission of the DCO application.

### *PCF Stage 2*

1.9.2. During PCF Stage 2, a seven week non-statutory public consultation was undertaken between Friday 9th December 2016 and Friday 27<sup>th</sup> January 2017. The consultation introduced the M42 Junction 6 improvement 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.

1.9.3. The environmental assessment during PCF Stage 2 was undertaken following the methodology described in the Design Manual for Roads and Bridges (DMRB) Volume 11 - Environmental Assessment and relevant interim notes, with data being gathered through desktop surveys and site walkovers/ surveys.

1.9.4. The options 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:

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<sup>9</sup> <http://www.legislation.gov.uk/uksi/2017/572/contents/made>

- **Option 1:** Southern Junction 2.4km 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 2.3km 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; and
  - **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.
- 1.9.5. The consultation included eight exhibitions and one webchat 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 questions. 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. There was a high level of support for the scheme to go ahead, with 71% of respondents supporting the need to improve the M42 Junction 6. 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.
- 1.9.6. Following the consultation period, additional stakeholder consultations and workshops were undertaken. During the workshops, variants to Option 1 were considered to mitigate concerns raised by a number of parties. Feedback from the public and stakeholder consultations was then included within the assessment of the final three options from which a recommendation for a preferred option was made to the Secretary of State for Transport. The preferred route announcement was made on 7 August 2017.

### *PCF Stage 3*

- 1.9.7. During PCF Stage 3 a range of consultation activities have progressed - this has included meetings with statutory bodies to formally introduce and provide further progress of the proposed scheme. Prior to submitting the Scoping Report to the Planning Inspectorate the following statutory bodies had been consulted with:
- SMBC;
  - Natural England;
  - The Environment Agency (EA); and
  - English Heritage.
- 1.9.8. The formal scoping opinion provided a range of responses from statutory and non-statutory consultees to be considered as part of the assessment process. It is noted that a number of statutory consultees did not respond formally within the scoping opinion. Any late consultation response as a result of the Planning Inspectorate's request to comment upon the EIA Scoping Report for the proposed scheme will be duly considered as the EIA is undertaken.
- 1.9.9. This PEI Report forms the basis for the statutory consultation exercise will occur in early 2018 and includes 6 (six) weeks of open consultation and a number of localised events to discuss the proposed scheme and the potential environmental impacts and effects with local residents.

## 1.10. Structure of this PEI Report

1.10.1. As the proposed scheme would involve modifications to the existing highway network, the design and assessment are being informed by guidance contained within the DMRB<sup>10</sup>, supplemented where necessary by the relevant Highways England Interim Advice Notes (IANs)<sup>11</sup>.

1.10.2. The information contained within this PEI Report has been structured in the following manner, taking into account relevant national policy (NPSNN) and applicable Planning Inspectorate Advice Notes<sup>12</sup>.

### Chapters 1 to 4

1.10.3. These chapters present background information to this PEI Report, details of the proposed scheme and the alternatives considered during its development, information relating to consultation undertaken to date, an overview of the existing environment within which the proposed scheme would be implemented, and details as to how the EIA will be undertaken.

### Chapters 5 to 15

1.10.4. These chapters present the emerging findings of the EIA process by environmental topic. Each discipline chapter summarises: information, data and records gathered to date relating to the existing environment; the potential effects associated with construction and operation of the proposed scheme; and the potential mitigation measures envisaged. The approach to assessing potential interactions between each environmental topic within the proposed scheme, and any interactions that the proposed scheme may have with other development projects, are considered in Chapter 15: Assessment of Cumulative Effects.

1.10.5. The specialist topics covered in Chapters 5 to 15 of this PEI Report are:

- Chapter 5: Air Quality
- Chapter 6: Cultural Heritage
- Chapter 7: Landscape
- Chapter 8: Biodiversity
- Chapter 9: Geology, Soils and Groundwater
- Chapter 10: Materials
- Chapter 11: Noise and Vibration
- Chapter 12: People and Communities
- Chapter 13: Road Drainage and the Water Environment
- Chapter 14: Climate
- Chapter 15: Cumulative Effects

### Appendices and Figures

1.10.6. These chapters provide the supporting number of appendices which present technical information concerning the EIA scope and its emerging findings in addition to the definitions of any terms and acronyms used and the associated figures for the Chapters referenced above.

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<sup>10</sup> <http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/index.htm>

<sup>11</sup> <http://www.standardsforhighways.co.uk/ha/standards/ians/index.htm>

<sup>12</sup> <https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/>

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## Non-Technical Summary

1.10.7. A separate non-technical summary of this PEI Report has been produced for wider readership by consultees.

### 1.11. Next Steps

1.11.1. As noted at Section 1.3, this PEI Report has been prepared to assist both the public and statutory stakeholders in understanding the potential impacts of the proposed scheme and mitigation measures proposed. A series of exhibitions are being held for members of the public between January and February 2018, where the proposed scheme will be presented. Comments made through the consultation process will be recorded in a database and reviewed by the project team.

1.11.2. Highways England will consider how to respond to the comments and consultation responses, and they will be taken into account in considering the need for further assessment and/or modification of the proposed scheme design or mitigation measures. The comments received will be used to produce a Consultation Report in accordance with Section 37 of the PA 2008, which will be submitted to the Planning Inspectorate with the DCO application. The Consultation Report will record comments made during consultation, and how those comments have been addressed in the proposed scheme design and the EIA.

1.11.3. Following submission of the DCO application, the Planning Inspectorate will consider, on behalf of the Secretary of State, whether the application should be accepted for examination. When accepted, the public will be able to make relevant representations about the proposed scheme and its potential impacts. The documents accompanying the application will be publicly available on the Planning Inspectorate's website, and the public will be able to submit comments to the Planning Inspectorate. These comments will then be considered as part of the examination into the DCO application.

1.11.4. Copies of this PEI Report will be available as part of the consultation material produced for the public consultations in 2018. Further details of the consultation events are available in the Statement of Community Consultation (SoCC) which can be accessed from the following link:

<http://roads.highways.gov.uk/projects/m42-junction-6-improvement/>

1.11.5. There will be a 6 (six) week period for members of the community to respond to the consultation. Responses can relate to the environmental issues addressed in this PEI Report, or to any other aspect of the proposed scheme. Responses can be made by completing a questionnaire, by letter, by email, or online, using any of the following addresses:

- By post: Highways England, M42 J6 Project Team, The Cube, 199 Wharfside Street, Birmingham, B1 1RN
- Website: [www.highways.gov.uk/m42-j6](http://www.highways.gov.uk/m42-j6)
- E-mail: [m42junction6@highwaysengland.co.uk](mailto:m42junction6@highwaysengland.co.uk)

1.11.6. The outcomes of the EIA will be reported in an ES, which will confirm the scale and significance of predicted environmental effects arising from the proposed scheme and the mitigation proposed in order to address those effects.



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## 2. The Proposed Scheme

### 2.1. Project Objectives

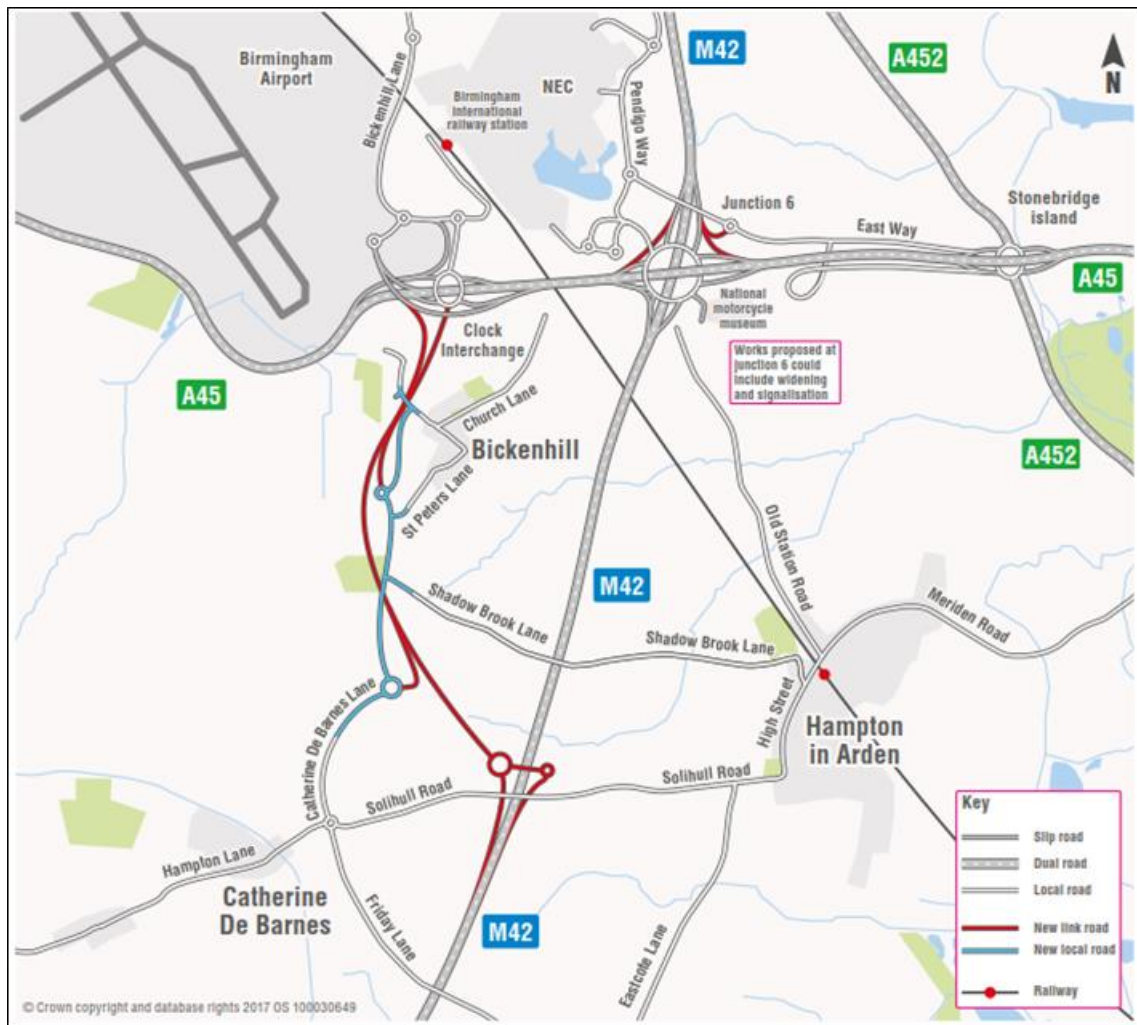
#### Background to the Project

- 2.1.1. The M42 Motorway is part of the Strategic Road Network (SRN) in the West Midlands. It provides links the M6, M6 Toll and M5 motorways. The M42 passes to the east and south of Birmingham, and forms the southern and eastern arms of the 'Birmingham Box'. This section of the SRN is seen as an essential interchange in an area identified for economic growth and substantial development opportunities.
- 2.1.2. Junction 6 serves a number of key strategic economic assets for both the local and wider community. These assets include Birmingham Airport, the NEC, Resorts World, JLR, Birmingham International Railway Station, the National Motorcycle Museum & Conference Centre (NMM) and Birmingham Business Park. In addition to these major assets, the area adjacent to M42 Junction 6 (immediately north-east of junction) is earmarked for development by SMBC as a proposed UK Central development which will also contain the Birmingham International HS2 railway station.
- 2.1.3. Given the immediate links to HS2, this region is expected to accommodate significant housing and employment growth. As a result, the traffic demands on the M42 and Junction 6 are forecast to grow quicker than the national average. Consequently, existing delays at the junction are anticipated to worsen due to increasing levels of traffic.

### 2.2. Project Location

- 2.2.1. The proposed scheme would be located to the west of the existing M42 Junction 6 (refer to Plate 1) in the area of green belt between Junction 5 and Junction 6 and would involve tie-in points to the existing SRN at the following locations: M42 Clock Interchange (SP: 18778 82970) and a proposed junction (SP: 19307 81306); and junction enhancements at the existing M42 Junction 6 (SP: 19819 83061).
- 2.2.2. The M42 Junction 6 provides connections between the national motorway network, and A45 Coventry Road which provides strategic access to Birmingham to the west, and Coventry to the east. Junction 6 lies on the eastern edge of Birmingham, approximately nine miles from the city centre, with the nearest town being Solihull.

**Plate 1: M42 Junction 6 - Location Plan / Preferred Route**



**The Existing SRN and Junctions and their Associated Problems**

*M42 Junction 6 and Approach to the Junction*

- 2.2.3. Junction 6 is a four-arm roundabout junction constructed within the topography of the surrounding environment. As such, the junction is above grade over the M42 motorway with the eastern extent of the junction being below grade beneath the Coventry Road (A45) and to the western extent above grade over the Coventry Road (A45).
- 2.2.4. In terms of access and egress points, the junction and motorway tie in through a number of on-slip and off-slip road junctions (clockwise around the junction):
  - North bound on-slip and southbound off-slip on to the M42, with a dedicated off ramp from the south bound off slip onto Eastway;
  - Eastbound on-slip onto Coventry Road (A45) from the M42 and a westbound off-slip from Coventry Road (A45) onto the junction roundabout;
  - A southbound on-slip onto the M42 from Junction 6, and a northbound off-slip from the M42 to Junction 6, in addition to a dedication off-slip link road from the M42 onto the westbound Coventry Road (A45); and

- A westbound on-slip from Junction 6 onto Coventry Road (A45) and an eastbound off-slip from the A45 onto junction. In addition, a local access road (South Way) is linked to Junction 6.

2.2.5. The junction is prone to congestion at peak times primarily from the M42 off the northbound off-slip onto the A45. This congestion is compounded at times when the NEC is hosting events, in addition to the regular landing schedules of long haul flights into Birmingham Airport.

2.2.6. This congestion inhibits the free flow of traffic safely off the M42 and can regularly lead to standing or slow moving traffic sitting on the on-slip and off-slips at Junction 6 waiting to gain access to the SRN.

#### *Clock Interchange*

2.2.7. Clock Interchange is considered a four-arm roundabout that links Coventry Road (A45) to Catherine De Barnes Lane (B4438) to the south and Bickenhill Lane to the north. In addition to those traffic movements, a sweeping two lane, west bound only off slip is provided from Coventry Road (A45) through to Airport Way.

2.2.8. The junction is prone to congestion, particularly when events are being held at the NEC and heavy traffic is leaving and entering the wider Birmingham Business Park. The congestion and subsequent delays at Clock Interchange noticeably increase when Junction 6 becomes congested, resulting in prolonged periods and lengths of the road network with stationary or slow moving traffic.

#### **Extra MSA**

2.2.9. As part of the wider economic development of the area, a planning application<sup>13</sup> for a proposed Motorway Service Area (MSA) has been submitted to SMBC by Extra MSA Group for determination.

2.2.10. If the MSA is granted consent, this development would construct the southern junction and integrate the MSA by means of a junction-arm off the southern junction. In addition, as part of MSA planning application, if approved, the proponents would construct the north facing on-slip and off-slip arrangements from the proposed southern junction onto and off the existing M42.

2.2.11. However, if the MSA is refused consent, Highways England would as part of the proposed M42 scheme construct the southern junction but without the inclusion of the north facing on-slip and off-slip roads. The proposed MSA does not form part of the proposed scheme that will be assessed in the EIA. It will be considered in the cumulative effects assessment in the event that consent is granted for the MSA.

### **2.3. Description of the Proposed Scheme**

2.3.1. The proposed scheme, as announced in the PRA, is shown in Plate 1. It comprises a new dumbbell 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, the realignment of the existing B4438 Catherine de Barnes Lane and junction improvements to the M42 Junction 6. These key features of the proposed scheme are described below.

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<sup>13</sup> <https://publicaccess.solihull.gov.uk/online/applications/applicationDetails.do?activeTab=documents&keyVal=NQRLYUOEHP00>

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### **A Dumbbell Junction to the South of the M42 Junction 6**

- 2.3.2. A new dumbbell junction known as the 'southern junction' would be constructed approximately 1.8km south of the existing Junction 6 and north of Shallowbrook Lane. The layout would include a three-arm junction on the west bound M42 carriageway and a two-arm junction on the east bound M42, with an upgraded bridge taking the existing Shallowbrook Lane over the M42. The new junction would include south facing slip roads for traffic movements off and on to the M42.

#### **Bypass to Clock Interchange**

- 2.3.3. The construction of a new bypass with an approximate length of 2.4km would be located to the west of the existing M42, commencing off the proposed three-arm roundabout as noted above with its alignment being primarily in a northerly direction. Initially the bypass would travel north westwards through open field networks to the north of Hampton Lane Farm where it would cross a number of Public Rights of Way (PRoW). At this point, a local roundabout would be constructed (Catherine De Barnes Roundabout) which would provide a tie-in from the existing Catherine De Barnes Lane (both in a north and southbound direction) to the proposed bypass.
- 2.3.4. As the proposed bypass continues north, it would cross Catherine De Barnes Lane approximately 70m south of the T-junction of Shadowbrook Lane. Approximately 500m north of the crossing point with Catherine De Barnes Lane, a second local roundabout (Bickenhill Roundabout) would be constructed to provide a north and south tie-in with Catherine De Barnes Lane and St Peters Lane. Between these two local roundabouts, Catherine De Barnes Lane would be realigned at its furthest point approximately 20m east of its current alignment.

#### **Integration of the New Bypass into Clock Interchange**

- 2.3.5. As the proposed bypass continues north to the west of the hamlet of Bickenhill and the existing Catherine De Barnes Lane, the bypass would cross back to the eastern side of Catherine De Barnes Lane passing over St Peters Lane and in to the wider field networks to the north. The proposed bypass would continue northwards and merge into the existing Clock Interchange.

#### **Upgrades to the Existing Junction 6**

- 2.3.6. As part of the proposed new bypass as detailed above, a number of junction flow improvements would be undertaken to compliment the proposed bypass - these would include:
- Dedicated on and off-slip lanes in a north bound and southbound direction on to and off the existing M42 from the A45 Coventry Road; and
  - A dedicated off-slip in a southbound direction off the existing M42 on the A45 Coventry Road in an eastbound direction.

## **2.4. Construction, Operation and Long Term Management**

### **Construction Activities**

- 2.4.1. The types of activities anticipated during the proposed scheme construction phase include:
- Movement of vehicles;
  - Enabling works (e.g. verge clearance);

- Earthworks;
- Minor demolition (e.g. concrete bases and footings);
- Excavation and installation of drains and communication ducts;
- Construction of retaining walls etc.;
- Surfacing works;
- Central reserve works;
- Installation of verge furniture and planting vegetation; and
- Stock piling/ storage.

2.4.2. The construction of the proposed scheme has yet to be fully determined, however a phased approach is likely. It is anticipated that the proposed scheme would be constructed in three main phases as detailed below.

*Phase 1*

2.4.3. This phase of the works include the construction of the proposed dual carriageway and the new southern junction off the M42 to Clock Interchange. The length of the dual carriageway would be approximately 2.4km, with the southern junction being constructed in a dumbbell arrangement. The proposed dual carriageway would be in cutting where possible following the topography of the area. As part of this phase of works, the existing B4438 Catherine De Barnes Lane would be realigned to interface at two locations, one to the north east of Catherine De Barnes, the second to the south west of Bickenhill where roundabouts provisions would be created to allow for local access.

*Phase 2*

2.4.4. This phase would involve upgrades to the A45 Clock Interchange to allow for the interface with the works associated with Phase 3. The works at Clock Interchange would include the addition of a third lane around the roundabout, and the improvements to lane markings to and from Clock Interchange from Bickenhill Lane.

*Phase 3*

2.4.5. This phase would involve upgrades to Junction 6 of the M42. Works would include the construction of the dedicated A45 east to M42 north free flow link and the associated lane marking changes, and the construction of the M42 south to Eastway roundabout free flow link and the M42 south to the A45 east free flow link.

**Construction Logistics**

2.4.6. The current proposals would allow for temporary traffic management areas, temporary working and storage areas, material stockpiles, construction compounds, haul roads, and provision for site compounds to be used during the construction and post construction maintenance periods. These details are being developed in parallel with the proposed scheme design and will be refined and assessed in the ES.

**Demolition Activities**

2.4.7. The proposed scheme does not require the demolition of existing major structures, although the Solihull Road overbridge over the M42 would need to be demolished and reconstructed as part of the works to accommodate the M42 north and southbound on and off slips, in addition to Heath End House to facilitate the proposed bypass. Although significant environmental effects are not anticipated from these demolition activities, an assessment of the demolished structures will form part of the ES.

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### Operation and Long Term Management

- 2.4.8. Once completed and operational, the long term management (including maintenance requirements<sup>14</sup>) of the new southern junction, the proposed dual carriageway and the works at Junction 6 would be absorbed as part of 'the network' as defined within the Strategic Highways company: licence<sup>15</sup>, held between Highways England's highway and the National Government.
- 2.4.9. It is anticipated that the remaining elements of the proposed scheme (i.e. the works at Clock Interchange and the works to the existing B4438 Catherine De Barnes Lane) would be adopted within the local road network that is operated and maintained by SMBC.
- 2.4.10. The final interface points between the SRN and the local road network are yet to be finalised. As the preliminary design continues, the details will be clarified and presented within the ES and the supporting engineering scope of works.

### Decommissioning

- 2.4.11. It is considered highly unlikely that the proposed scheme would be demolished after its design life as the road is likely to have become an integral part of nationally important infrastructure. In the unlikely event of removal or demolition, this would be part of the relevant statutory process at that time, including EIA as appropriate. Demolition of the proposed scheme is not considered further in this PEI Report on this basis.

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<sup>14</sup> Standard operational maintenance will be undertaken by Highways England's Managing Agent Contractor (MAC). For the Midlands this is referred to as MAC Area 7.

<sup>15</sup> <https://www.gov.uk/government/publications/strategic-highways-company-licence>

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### 3. ASSESSMENT OF ALTERNATIVES

#### 3.1. Scheme History

##### Preliminary Options Identification

- 3.1.1. In 2016 Highways England explored a number of high level opportunities to alleviate traffic congestion in and around the M42 Junction 6 area in the section of the SRN most commonly referred to as the 'Birmingham Box'. As part of the high level exercise, approximately 40 individual solutions were appraised against a number of criteria, ranging from economic benefit, through to buildability and potential environmental impact. The 40 options were sifted down to three options, which formed the basis of the public consultation event that occurred in December 2016 to January 2017 (refer to Section 1.7).

#### 3.2. Selection of the Proposed Scheme

##### Scheme Options

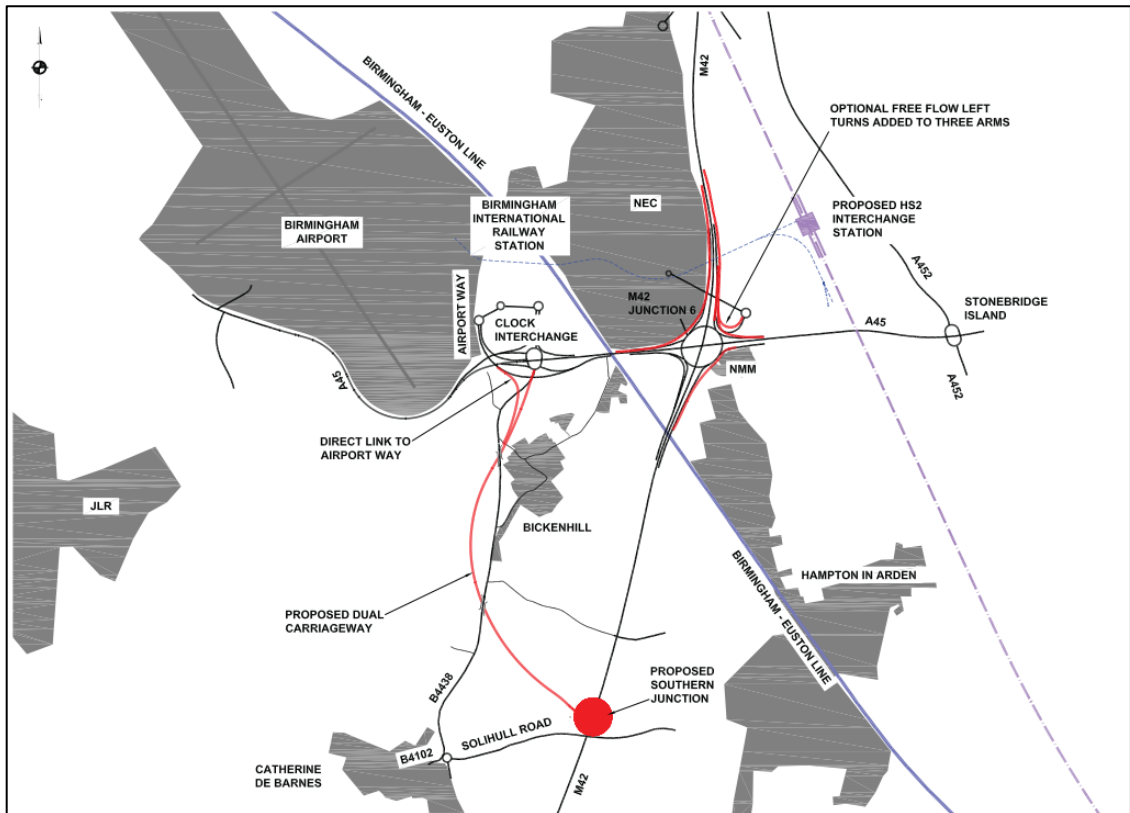
- 3.2.1. From the 2016 exercise, the viable solutions taken forward for further development and through public consultation were all variants of a southern junction. The three options that were taken to consultation were:

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

##### *Option 1*

- 3.2.2. Option 1 (see Plate 2) comprised a new 2.4km dual carriageway link between the Clock Interchange and an all movements junction allowing north and south access to the M42 north of Solihull Road. The Clock Interchange would be improved to accommodate additional flows of traffic, in addition to free flow links being provided to give improved access to Birmingham Airport and A45 west.
- 3.2.3. The new dual carriageway would be to the west of Bickenhill and would generally be below ground level crossing underneath the B4438 (Catherine De Barnes Lane), near Bickenhill and towards the M42. The alignment would tie closely into the existing local road corridor to minimise the effect on the green belt.
- 3.2.4. Connection onto the local roads could be designed to minimise long distance traffic use of locals while enabling access to the Clock Interchange.

**Plate 2: M42 Junction 6 Public Consultation Option 1 - Link to the West of Bickenhill**

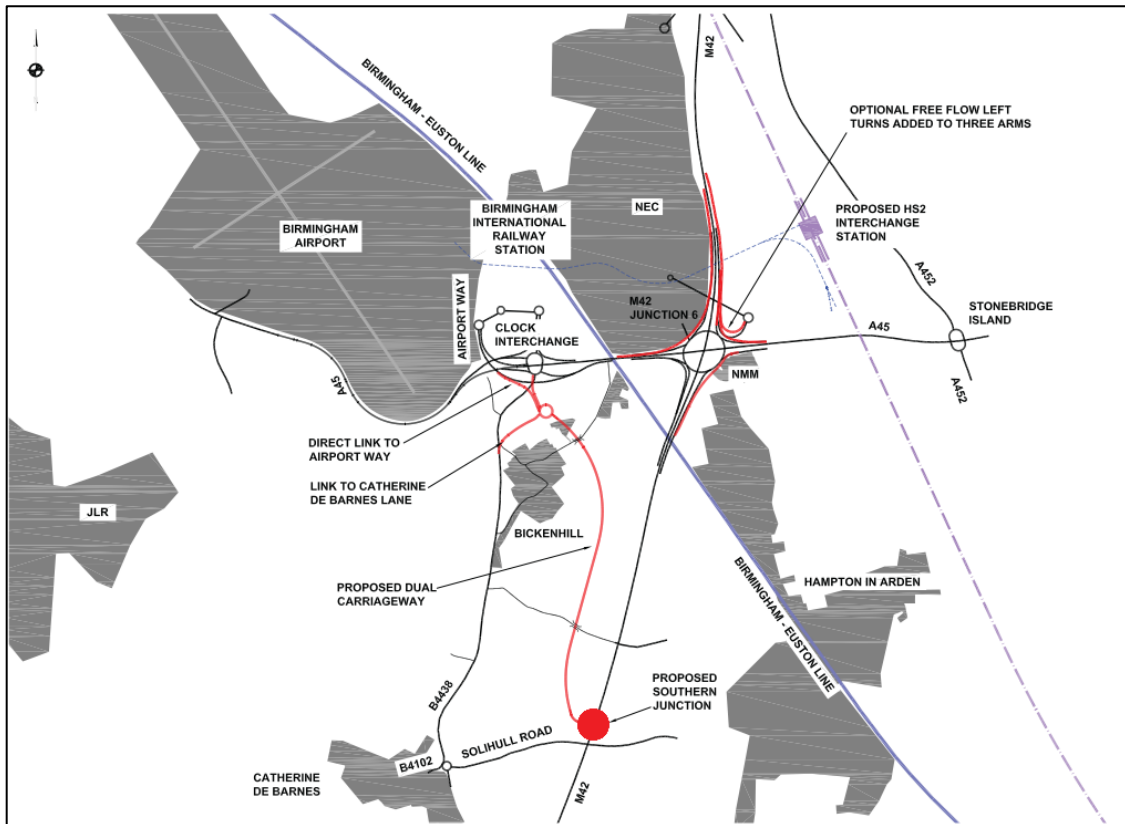


*Option 2*

- 3.2.5. Option 2 (see Plate 3) comprised a new 2.3km dual carriageway link between the Clock Interchange and an all movements junction allowing north and south access to the M42 north of Solihull Road. The Clock Interchange would be improved to accommodate the additional flows of traffic, in addition to a free flow link being provided to offer improved access to Birmingham Airport and the A45 west.
- 3.2.6. The new dual carriageway would be to the east of Bickenhill and pass beneath Church Lane before returning to existing levels north of Shadowbrook Lane. The alignment would minimise effects on the green belt as it would be closer to the existing M42 corridor through the area.
- 3.2.7. Connection onto the local roads would be via a new roundabout north of Bickenhill. This roundabout would be at existing ground level with link roads to the Clock Interchange, Catherine De Barnes Lane and Airport Way.



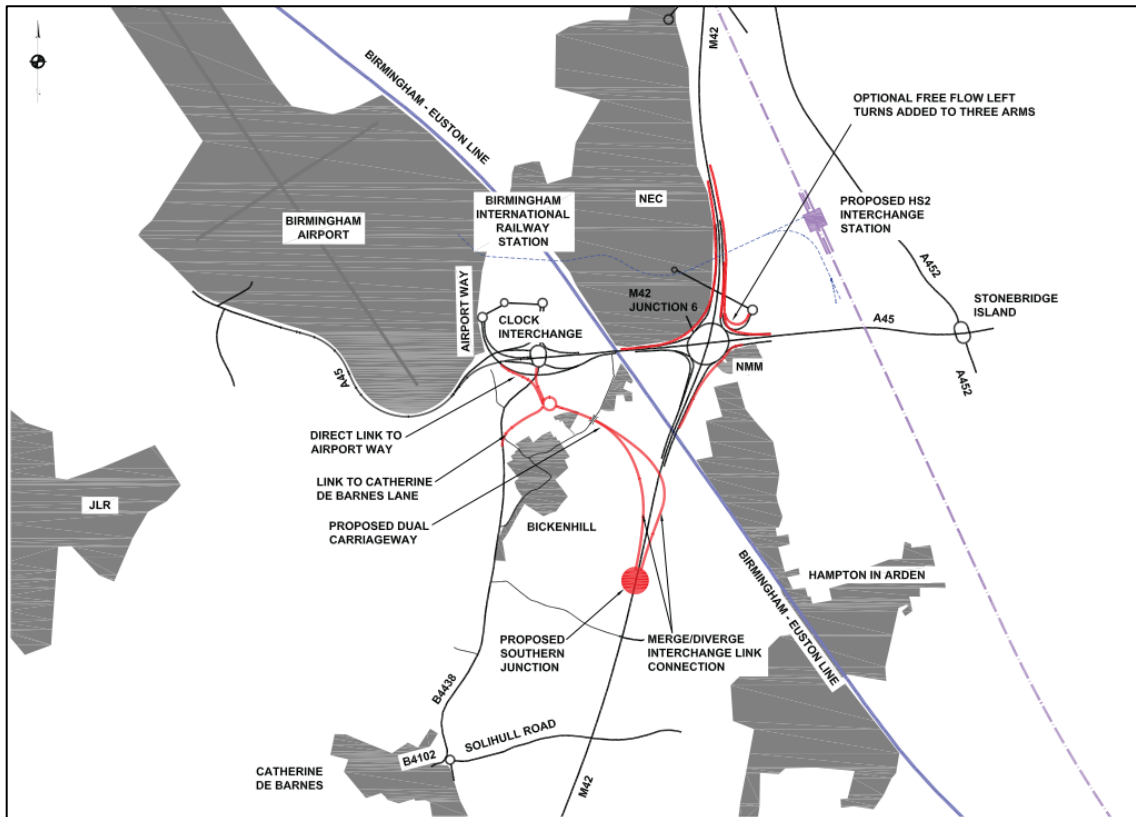
**Plate 3: M42 Junction 6 Public Consultation Option 2 - Link to the East of Bickenhill**



*Option 3*

- 3.2.8. Option 3 (see Plate 4) comprised a new 1.6km dual carriageway link between the Clock Interchange and a restricted movement junction with the M42 north of Shadowbrook Lane. This junction would only enable traffic to join the M42 southbound or exit from the M42 northbound using free flow links. The Clock Interchange would be improved to accommodate the additional flows of traffic and a free flow link would be provided to improve access to Birmingham Airport and A45 West.
- 3.2.9. The new dual carriageway would be to the east of Bickenhill and pass beneath Church Lane before rising on and embankment to cross the M42 on a large bridge. The alignment would minimise the effect on the green belt as it is closer to the existing M42 corridor through the area.
- 3.2.10. Connection onto local roads would be via a new roundabout north of Bickenhill. This roundabout would be at the existing ground level with link roads to the Clock Interchange, Catherine De Barnes Lane and Airport Way.

**Plate 4: M42 Junction 6 Public Consultation Option 3 - Link to the East of Bickenhill**



### Public Consultation Results

3.2.11. In response to the question 'To what extent do you agree or disagree that M42 Junction 6 needs improving?' 71% of those who responded agreed there was a need to improve the junction and 64% of respondents expressed a preference for Option 1. 15% of respondents preferred Option 3, 10% preferred Option 2, while 11% of those who responded gave no preference.

3.2.12. Following the public consultation, Highways England continued to develop the presented options taking into account comments and issues raised during the consultation.

### Environmental Considerations of the Options

3.2.13. During PCF Stage 2 and based upon the findings and conclusions of the public consultation results, Mouchel/ WSP undertook an early environmental options appraisal exercise based upon the environmental topics presented within the Department for Transport (DfT) WebTAG appraisal process.

3.2.14. The decision route on choice was based on the following criteria:

- DfT RIS brief;
- Highways England imperatives;
- Scheme economics;
- Public consultation results;
- Environmental effects;

- Highways England Key Performance Indicators; and
- General considerations (e.g. stakeholder issues, buildability, numbers of departures from standards).

3.2.15. The input into the route option environmental appraisal is presented in Table 3.1.

**Table 3.1: Environmental Appraisal of Options 1, 2 and 3 at PCF Stage 2**

Environmental Discipline Considered	Options Appraised		
	Option 1	Option 2	Option 3
<b>Noise</b>	<p>Option 1, 2 and 3 have 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. Within 1km of the corridor for options 1, 2 and 3 there are four Defra Noise Important Areas (NIAs):</p> <ol style="list-style-type: none"> <li>1. on the A45 at Elmdon, (reference number 2830);</li> <li>2. on the A45 West of Junction 6, (ref no 2831);</li> <li>3. on the M42 South of Junction 6 (ref no 7481); and</li> <li>4. on the West of the M42 further south between Junction 5 and Junction 6 (ref no 7482).</li> </ol>		
	<p>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. Potentially there are:</p> <ul style="list-style-type: none"> <li>• 207 dwellings; and</li> <li>• 10 other noise receptors</li> </ul> <p>- within 600m of the proposed alignment.</p>	<p>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. Potentially there are:</p> <ul style="list-style-type: none"> <li>• 147 dwellings; and</li> <li>• 9 other receptors</li> </ul> <p>- within 600m of the proposed alignment</p>	<p>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. Potentially there are:</p> <ul style="list-style-type: none"> <li>• 144 dwellings; and</li> <li>• 9 other noise sensitive receptors</li> </ul> <p>- within 600m of the proposed alignment.</p>
<b>Air Quality</b>	<p>Option 1, 2 and 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 km from all proposed options. One Pollutant Climate Mapping (PCM) model link (A45) is located within 200m of the proposed options.</p>		

	<p>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.</p> <p>Potential receptors within 200m of the proposed alignment:</p> <ul style="list-style-type: none"> <li>• 0m-50m = 14 receptors</li> <li>• 50m-100m = 13 receptors</li> <li>• 100m-200m = 39 receptors</li> </ul> <p><i>Total = 66 receptors</i></p>	<p>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.</p> <p>Potential receptors within 200m of the proposed alignment:</p> <ul style="list-style-type: none"> <li>• 0m - 50m = 10 receptors</li> <li>• 50m - 100m = 13 receptors</li> <li>• 100m - 200m = 38 receptors</li> </ul> <p><i>Total = 61 receptors</i></p>	<p>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</p> <p>Potential receptors within 200m of the proposed alignment:</p> <ul style="list-style-type: none"> <li>• 0m - 50m = 4 receptors</li> <li>• 50m -100m = 10 receptors</li> <li>• 100m - 200m = 41 receptors</li> </ul> <p><i>Total = 55 receptors</i></p>
<p><b>Greenhouse Gases</b></p>	<p>Alleviation of road traffic congestion as a result of the implementation of all options 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.</p>		
<p><b>Landscape</b></p>	<p>Overall, the elements of option 1 and 2 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.</p>	<p>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</p>	

	<p>Option 1 would result in the permanent loss of existing:</p> <ol style="list-style-type: none"> <li>1. woodland, within and beyond the highways boundary (including Ancient Woodland);</li> <li>2. fragmentation of field patterns around the new link road;</li> <li>3. alterations to the existing landform;</li> <li>4. increased traffic movements; and</li> <li>5. lighting within the landscape.</li> </ol>	<p>Option 2 would result in the permanent loss of:</p> <ol style="list-style-type: none"> <li>1. existing woodland within and beyond the highways boundary (including Ancient Woodland);</li> <li>2. fragmentation of field patterns around the new link road;</li> <li>3. alterations to the existing landform;</li> <li>4. increased traffic movements; and</li> <li>5. lighting within the landscape.</li> </ol>	<p>However, Option 3 would not result in significant changes to the perception of the landscape in the wider study area. Option 3 would result in the permanent loss of:</p> <ol style="list-style-type: none"> <li>1. fragmentation of field patterns around the new link road;</li> <li>2. alterations to the existing landform;</li> <li>3. detractions to the setting of Bickenhill and loss of residential properties;</li> <li>4. increased traffic movements; and</li> <li>5. lighting within the landscape</li> </ol>
	<p>Qualitative Classification: <b>Moderate Adverse</b></p>	<p>Qualitative Classification: <b>Moderate Adverse</b></p>	<p>Qualitative Classification: <b>Slight Adverse</b></p>
<p><b>Historic Environment</b></p>	<p>There is the potential for this option to be directly impacted upon; one Conservation Area and 20 non-designated heritage assets.</p> <p>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.</p> <p>Number of known heritage assets affected is at least 33.</p>	<p>There is the potential for this option to be directly impacted upon one Conservation Area and 22 non-designated heritage assets</p> <p>The assets consist of a mixture of sites dating from the Medieval and Post Medieval periods. The setting of 1 scheduled monument; and 11 listed buildings will also be impacted upon.</p> <p>Number of known heritage assets affected is at least 34</p>	<p><b>No qualitative supporting text provided.</b></p> <p>Number of known heritage assets affected is at least 20.</p>

	Qualitative Classification: <b>Moderate Adverse</b>	Qualitative Classification: <b>Moderate Adverse</b>	Qualitative Classification: <b>Moderate Adverse</b>
<b>Biodiversity</b>	Option 1, 2 and 3 will result in the loss of UK and Local Biodiversity Action Plan (LBAP) 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. Option 1, 2 and 3 will also likely impact on protected and notable fauna, if present. Impacts are currently unknown but are likely to be Neutral to Slight Adverse.		

	<p>Major adverse impact on Bickenhill Meadows Site of SSS. Moderate adverse impact on Aspbury's Copse Ancient Woodland/Local Wildlife Site (LWS)/Ecosite. Slight Adverse impact on Castle Hill Farm Meadows LWS, Clock Lane Meadows Ecosite and Main Birmingham to London Railway Line Ecosite due to direct land-take. Slight Adverse impacts to Hollywell Brook LWS due to in-stream works and culvert extension.</p> <p>This option will also likely impact:</p> <ul style="list-style-type: none"> <li>• Coleshill and Bannerly Pools SSSI</li> <li>• Bickenhill Meadows SSSI,</li> <li>• Castle Hill Farm Meadows LWS</li> <li>• Green Wards Piece LWS/Ecosite</li> <li>• Bickenhill Churchyard Ecosite</li> <li>• Clock Lane Meadows Ecosite Meadows to the East of the Jungle Ecosite;</li> </ul> <p>- due to increased nitrogen deposition, but the magnitude of this impact is currently unknown.</p>	<p>Moderate adverse impact on Aspbury's Copse Ancient Woodland/LWS/Ecosite. Slight Adverse impact on Roadside Hedge LWS/Ecosite and Main Birmingham to London Railway Line Ecosite due to direct land-take. Slight Adverse impacts to Hollywell Brook LWS due to in-stream works and culvert extension.</p> <p>This option will also likely impact:</p> <ul style="list-style-type: none"> <li>• Coleshill and Bannerly Pools SSSI</li> <li>• Bickenhill Meadows SSSI</li> <li>• Castle Hill Farm Meadows LWS</li> <li>• Green Wards Piece LWS/Ecosite</li> <li>• Wayside Cottage Meadows LWS/Ecosite</li> <li>• Bickenhill Churchyard Ecosite</li> <li>• Clock Lane Meadows Ecosite and Meadows to the East of the Jungle Ecosite</li> </ul> <p>- due to increased nitrogen deposition. The magnitude of this impact is currently unknown.</p>	<p>Slight Adverse impact on Main Birmingham to London Railway Line Ecosite due to direct land-take.</p> <p>Slight Adverse impacts to Hollywell Brook LWS due to in-stream works and culvert extension.</p> <p>This option will also likely impact:</p> <ul style="list-style-type: none"> <li>• Coleshill and Bannerly Pools SSSI</li> <li>• Bickenhill Meadows SSSI</li> <li>• Castle Hill Farm Meadows LWS</li> <li>• Green Wards Piece LWS/Ecosite</li> <li>• Wayside Cottage Meadows LWS/Ecosite</li> <li>• Bickenhill Churchyard Ecosite</li> <li>• Clock Lane Meadows Ecosite and</li> <li>• Meadows to the East of the Jungle Ecosite</li> </ul> <p>- due to increased nitrogen deposition. The magnitude of this impact is currently unknown.</p>
	<p>Qualitative Classification: <b>Major Adverse</b></p>	<p>Qualitative Classification: <b>Moderate Adverse</b></p>	<p>Qualitative Classification: <b>Slight Adverse</b></p>

<b>Water Environment</b>	<p>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. Option 1, 2 and 3 are likely to have a Moderate Adverse impact upon the surrounding water environment, with the highest risk being increased flood risk.</p>		
	<p>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.</p> <p>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.</p> <p>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).</p> <p>The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.</p>	<p>In addition to the surface water features mentioned above Option 2 will also affect 'other field drains'.</p> <p>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.</p> <p>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.</p> <p>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).</p> <p>The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.</p>	<p>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.</p> <p>Option 3 features a relatively smaller impermeable surface area, two new culverts and three existing culverts lengthened.</p> <p>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.</p> <p>The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.</p>
	<p>Qualitative Classification: <b>Moderate Adverse</b></p>	<p>Qualitative Classification: <b>Moderate Adverse</b></p>	<p>Qualitative Classification: <b>Moderate Adverse</b></p>



3.2.16. As a result of the option assessment, Option 1 (in conjunction with the output of all the criteria outlined in para. 3.2.15) was considered the most viable option to progress for the following factors:

- 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 (MSA) 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.

3.2.17. During the public consultation, an objection was raised by the Gaelic Athletic Association (GAA) to Option 1 as it impacted a number of sports fields under their ownership. The WSP / Mouchel project team looked at potential variants to the alignment which would lessen or totally avoid impact to the fields.

3.2.18. Three alternative options were subsequently developed and appraised Options 1A, 1B and 1C.

- Option 1A re-aligned the route to the west of the GAA sports fields entirely avoiding the facility but in turn would pass through Bickenhill Meadows SSSI;
- Options 1B impacted one of the sports fields, but affected one property in Bickenhill (Heath End House); and
- Option 1C avoided all three sports fields but had incrementally larger impact on the western side of Bickenhill.

3.2.19. A general appraisal 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 would move the road by approximately 50m to the east from the alignment of Option 1 and is considered a viable alternative to Option 1 due to its reduced impact on the GAA fields.

3.2.20. As a result, through further meetings that were held and appraisal on the land area impacted by all the variants, an understanding was reached with the GAA. This would involve relocating the existing GAA to a new location in proximity to their existing site. The details of this relocation are still to be agreed and negotiations are ongoing between Highways England and the GAA. For the purpose of the environmental assessment the relocation of the GAA will be considered as 'associated development'.

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### Highways England Preferred Option

- 3.2.21. Environmental Appraisal work undertaken as part of PCF Stage 2 demonstrated that a slightly modified version of Option 1 would provide the best performing route overall by minimising the impact on local communities and a nearby Bickenhill Meadows Site of Special Scientific Interest (SSSI), while maximising the resilience and performance of the local road network to allow it to cope with future traffic increases.
- 3.2.22. The proposed modification to Option 1 was incorporated into the proposed scheme design in August 2017 and resulted in Option 1B forming the basis of the PRA published on 7th August 2017. The modification moves the proposed link between Clock Interchange and the proposed southern junction approximately 50m closer to Bickenhill as it passes the south west corner of the village in order to minimise the impact on a local business and the SSSI.
- 3.2.23. The options appraisal process 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.
- 3.2.24. The southeast free flow link element was removed from the proposed scheme due to challenges with the horizontal and vertical alignment of link, impact on current access arrangements to adjacent businesses and prohibitively high construction costs compared to potential benefits.
- 3.2.25. The north facing slip roads from the new southern junction were also removed from the proposed scheme. Traffic analysis showed that relatively few vehicles would use the north facing slip roads and their inclusion would require departures from standard for reduced weaving length between the new junction and M46 Junction 6. Although the slip roads would add resilience to the network, the capital cost and operational safety impact were assessed as outweighing the resilience benefit.

### 3.3. Development of the Proposed Scheme

- 3.3.1. Highways England announced the Preferred Route on 7th August 2017 and it is this route which forms the basis for the proposed scheme considered within this PEI Report.
- 3.3.2. Design development is ongoing, and is being informed by the iterative EIA process, consultation and evolving knowledge of the environment that would be affected by the proposed scheme. Elements of the design which will be developed further through 2017 - 2018 include, but are not limited to:
- New southern junction layout and geometry;
  - Overbridge construction over the M42;
  - Underpass requirements along the B4438;
  - Site compounds and laydown areas;
  - Enhancement and compensation areas;
  - Emergency and maintenance crossing points;
  - Non-Motorised User (NMU) facilities;
  - Drainage strategy;
  - Lighting;
  - Technology and signage; and
  - Landscape/earthworks design.

3.3.3. The reasonable alternatives which are being considered within the proposed scheme design during 2017 - 2018 will be reported in the ES. The proposed scheme design development will pay due regard to the outcomes from public consultation, the principles of good design, and the requirements of the NPSNN. The main reasons for rejection of the reasonable alternatives and the selection of the chosen option will be reported in accordance with the requirements of the EIA regulations.

### **3.4. Iterative Design**

3.4.1. To guide the decisions made for design elements that are highlighted above, the following design options have been applied or will be considered as part of the EIA process to minimise the overall environmental effect of the proposed scheme as far as practicable:

- The exact location of the southern junction is yet to be finalised, minor amendments to its exact location will be explored through the design process to lessen the overall impact Aspbury's Copse Ancient Woodland;
- tie into the existing B4438 Catherine de Barnes Lane, side roads and private accesses, by considering whether roads should be retained open to traffic, fully closed, or partially closed to vehicles;
- tie into the public rights of way network, by considering the types of access required for pedestrians, cyclists and equestrians and whether this can be maintained, provided or enhanced;
- integrate with the existing landscape, by considering where earthworks should be steep to reduce the area of land they would occupy, or where the angle of earthworks slopes can be reduced to improve their appearance in views;
- cross watercourses, streams and ditches should be diverted, crossed with bridges, or contained within concrete structures (called culverts);
- manage road drainage, by considering how and where water from the road can be directed, and where ponds could be used to hold water prior to its release into local watercourses;
- consideration of where environmental features can be included in the design, such as landscaping, fencing and the use of carriageway surfacing that reduces noise;
- consideration of how and where measures such as access tracks around the road and gates should be provided, to enable continued access for landowners (properties and land), users of community facilities and residents; and
- avoid or reduce effects on important features by considering where minor design changes could be made to reduce effects on the landscape, important habitats, watercourses and features of historic importance.

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## 4. ENVIRONMENTAL ASSESSMENT METHODOLOGY

### 4.1. General Approach

#### **The National Networks National Policy Statement (NPSNN)**

- 4.1.1. Strategic roads have their own policy framework, with relevant policy objectives set out in the NPSNN. The NPSNN is framed in the context of wider Government policies on environment, safety, technology, sustainable transport and accessibility. It provides planning guidance for promoters of NSIPs on the road network, and the basis for the examination by the Examining Authority and decisions by the Secretary of State on the proposed scheme.
- 4.1.2. The Secretary of State will use the NPSNN as the primary basis for making decisions on development consent applications for the proposed scheme. Given the importance of the NPSNN, the EIA approach adopted for the proposed scheme takes account of this key policy document. The EIA for the proposed scheme will ensure all of the methodological requirements within Chapter 5 of the NPSNN are met.

#### **The Design Manual for Roads and Bridges (DMRB)**

- 4.1.3. Guidance published by the Government for the preparation of environmental assessments of proposed road schemes is contained in the DMRB Volume 11. This sets out both the general process and the methods for assessing individual environmental topics. This PEI Report takes guidance from Interim Advice Note (IAN) 125/15 Environmental Assessment Update, which provides a new structure of DMRB Volume 11.
- 4.1.4. DMRB Volume 11 advises on the environmental topics to be included in an EIA, and the methods to be used in the assessment for each of those topics. The topics identified in Section 5 to 14 of this PEI Report are those suggested within the DMRB and by the EIA Regulations and have been stipulated in the EIA Scoping Report for the proposed scheme.
- 4.1.5. The EIA being undertaken adheres to the most up-to-date, relevant guidance contained in DMRB and Highways England IANs. The methodologies used for individual topics were provided in the EIA Scoping Report. Should revisions to IANs or DMRB be issued between the PEI Report and reporting of the EIA in the ES, they will be adopted where appropriate, provided that it is reasonable to do so within the programme and governance for the project. Changes in environmental legislation, such as the technical requirements under the EIA Regulations, will be accommodated within the ES as relevant.

### 4.2. Existing Baseline and Future Conditions

- 4.2.1. In order to identify the effects of the proposed scheme on the environment, it is important to understand the environment that would be affected by the proposed scheme (the 'baseline conditions'). Understanding the baseline allows the measurement of changes that would be caused by the proposed scheme.
- 4.2.2. The baseline conditions are not necessarily the same as those that exist at the current time; they are the conditions that would exist in the absence of the proposed scheme either (a) at the time that construction is expected to start, for impacts arising from construction or, (b) at the time that the proposed scheme is expected to open to traffic, for impacts arising from the operation of the proposed scheme. Therefore, the identification of the baseline conditions involves predicting changes that are likely to

happen in the intervening period, for reasons unrelated to the proposed scheme. This will entail taking current conditions and committed development into consideration and using experience and professional judgment to predict what the baseline conditions might look like prior to start of construction and operation.

- 4.2.3. This PEI Report presents baseline information representing the understanding at the time of writing. This baseline will become further developed as individual technical surveys are undertaken and as additional data are obtained. The relevant baselines for each topic will be presented in the ES, using appendices where required.
- 4.2.4. A 'future' baseline has been defined, against which the predicted conditions during proposed scheme construction can be compared. For construction the future baseline is defined as being 2020 as this is the year that construction activities are anticipated to be initiated (subject to proposed scheme approval).
- 4.2.5. A 'future' assessment year has been defined, against which the predicted conditions during proposed scheme operation can be compared. Where landscape mitigation is likely to be required, this future assessment year scenario is usually a minimum of 15 years after proposed scheme opening to allow for planted vegetation to have grown to a reasonable level. However, a less distant future year assessment can be adopted if it is more appropriate (for example if it reflects traffic modelling outputs). Indeed, different disciplines can use different future scenarios if this is more appropriate.
- 4.2.6. It is proposed that the EIA address the defined timescales as follows (all of which are subject to potential review):
- **Current Baseline Conditions (2017 - 2018):** this scenario describes the existing conditions in the vicinity of the proposed scheme;
  - **Future Baseline Conditions (2020):** this scenario considers the future conditions prior to the start of proposed scheme construction activities. Other future baseline scenario years can be used if appropriate, and where specified as they are predicted to be in the period immediately prior to the start of construction;
  - **Construction (2020 - 2023):** this scenario describes the conditions during the construction phase (construction phase duration is subject to review);
  - **Operation (2024):** this scenario describes the conditions predicted to be associated with the full operation of the proposed scheme within its first year of opening; and
  - **Future Year Assessment (2038):** this scenario considers the future conditions with and without the proposed scheme and facilitates a comparison between the two. Other future baseline scenario years can be used if appropriate, and where specified.

#### **Establishment of the Baseline**

- 4.2.7. In order to enable an assessment of environmental effects associated with the proposed scheme, it is first necessary to define baseline environmental conditions. As such, environmental data regarding the area in the vicinity of the proposed scheme have been collated and reviewed.
- 4.2.8. Desk-based data sources have comprised: available literature/studies related to the study area; databases, records and schedules relating to environmental designations; national, regional and local policy documents; historic and current mapping; available aerial photography and data from previous environmental studies.

- 4.2.9. Where necessary, site surveys have been (or will be) undertaken, such as ecology, noise and landscape. Such surveys aim to supplement data gathered during the desk-based review, and to further define environmental resource/receptor sensitivity and value, which in turn assists with the understanding of impact magnitudes, effect significance and possible mitigation requirements.

### **4.3. Potential Significant effects and Mitigation**

#### **Defining Assessment Years and Scenarios**

- 4.3.1. The assessment of effects involves comparing a scenario with the proposed scheme against one without the proposed scheme over time. The absence and presence of a proposed scheme are referred to as the 'Do Minimum' and 'Do Something' scenarios respectively. The 'Do Minimum' scenario represents the future baseline with minimal interventions and without new infrastructure.
- 4.3.2. Depending on the topic, the potential effects in the PEI Report (which will be confirmed within the ES) are assessed for the 'Do Minimum' and 'Do Something' scenarios in the baseline year (assumed to be the year of opening for the purposes of the PEI and ES) and a future assessment year (assumed to be 15 years after opening) for both construction and operation
- 4.3.3. Demolition of the proposed scheme has been scoped out of the EIA on the basis that the road would become an integral part of national infrastructure and would not be decommissioned.

#### **Identifying Potential Effects**

- 4.3.4. The EIA Regulations require: "*The description of the likely significant effects*" of the proposed scheme on the environment, covering "*the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development*". The PEI Report provides a preliminary view on likely significant effects, which will be refined during the ongoing EIA and design process.
- 4.3.5. In order to understand if likely significant effects are to be generated, the potential impacts of the scheme need to be identified through the application of the following process:
- 4.3.6. Impacts are changes that are predicted to result from the proposed scheme. Impacts could occur during the construction or operational phases of the proposed scheme and these phases will be considered separately during the environmental assessment. Wherever possible, impacts will be quantified as part of their description. An impact and the way it is described are the same for every specialist topic considered. The character of the impact, its magnitude or scale, the probability that it will occur; its duration, frequency and reversibility are all elements of its description. An impact is not adverse or beneficial in its own right; rather impacts are the changes that are subsequently assessed from the perspective of a relevant receptor.
- 4.3.7. The consequence of an impact on a receptor is called an effect. Effects can be beneficial or adverse. It is quite possible for different receptors (even within the same specialist environmental topic) to consider the same impact in different ways, depending on the ways they are affected by that impact. Effects can be permanent, even if the impact is temporary or reversible, and vice versa.

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- 4.3.8. Impacts and/or their resulting effects may arise as a direct result of the proposed scheme, or may be produced from or as a result of a more complex pathway or interaction (when they are referred to as secondary or indirect impacts/effects).
- 4.3.9. For an effect to occur there has to be an impact, a receptor, and a pathway by which the impact can influence the receptor. Specialist topics therefore need to identify and evaluate receptors that have the potential to be affected by identified construction or operation phase impacts.
- 4.3.10. In carrying-out the assessment, the category (or relative significance) of the effect is a product of the importance and/or sensitivity of the receptor and the magnitude of the impact (taking into account factors such as the receptor's sensitivity or resilience). The degree of confidence in the results also needs to be reported.
- 4.3.11. Wherever possible, the ongoing assessment has been used to influence the proposed scheme design such that impacts and / or effects can be designed-out or avoided, or otherwise limited in their magnitude, duration etc. Such measures will be reported in the Environmental Statement.
- 4.3.12. Likely effects will be assessed and categorised to identify those that are significant. The potential significance of effects will be assessed taking into account the impact avoidance measures embedded within the proposed scheme design as well as the standard management practices that will be implemented.
- 4.3.13. After the effects of the proposed scheme as designed have been assessed, any further measures required to mitigate such effects (especially where effects are deemed to be significant) will be considered. Thereafter, the remaining residual effects will be reported. Compensation measures may then be described if deemed to be necessary.
- 4.3.14. Residual effects of moderate, large or very large significance are deemed to constitute a significant environmental effect in the context of the EIA Regulations. Accordingly, these effects represent key factors in the decision-making process.

#### **Assessing Significance**

- 4.3.15. The significance of an environmental effect is typically a function of the 'value' or 'sensitivity' of the receptor and the 'magnitude' or 'scale' of the impact. DMRB Volume 11, Section 2, Part 5 HA 205/08 'Assessment and Management of Environmental Effects' provides advice on typical descriptors of environmental value, magnitude of change and significance of effects.
- 4.3.16. The DMRB recognises "*the approach to assigning significance of effect relies on reasoned argument, professional judgement and taking on board the advice and views of appropriate organisations. For some disciplines, predicted effects may be compared with quantitative thresholds and scales in determining significance. Assigning each effect to one of the five significance categories enables different topic issues to be placed upon the same scale, in order to assist the decision-making process at whatever stage the project is at within that process*".
- 4.3.17. The approach to assessing significance for each discipline is defined in the EIA Scoping Report and will be restated in the ES.

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### Mitigation Measures, Enhancements and Residual Effects

- 4.3.18. The EIA will take into account any design measures that have been incorporated into the proposed scheme design, as well as any standard management activities that the proposed scheme will implement.
- 4.3.19. Mitigation of potentially significant adverse environmental effects will be an iterative part of the proposed scheme development following the hierarchy below:
- **Avoidance:** incorporate measures to avoid the effect, for example, alternative design options or modifying the proposed scheme programme to avoid environmentally sensitive periods.
  - **Reduction:** incorporate measures to lessen the effect, for example, fencing off sensitive areas during construction and implementing a Construction Environmental Management Plan (CEMP) to reduce the potential impacts from construction activities.
  - **Compensation/Remediation:** where it is not possible to avoid or reduce a significant effect then offsetting measures should be considered, for example the provision of replacement of habitat to replace that lost to the proposed scheme or remediation such as the clean-up of contaminated soils.
  - **Enhancement:** where possible enhancement measures will be incorporated into the proposed scheme. Enhancement measures are considered to be over and above any avoidance, mitigation and compensation measures required to remove the adverse impacts of the proposed scheme.
- 4.3.20. Within the PEI Report, the individual technical chapters identify the possible mitigation measures that are proven, supported by evidence and can be delivered as part of the scheme to mitigate any potential significant effects which have been identified within that discipline to date.
- 4.3.21. Effects that remain after mitigation are referred to as residual effects. The assessment of the significance of the residual effects after mitigation and/ or enhancement is the key outcome of the EIA and will be reported in the ES.

### Assessment of Cumulative Effects

- 4.3.22. Cumulative effects are the result of multiple impacts on environmental receptors or resources. There are principally two types of cumulative impact:
- The combined action of a number of different environmental topic specific impacts upon a single resource/ receptor (in combination); and
  - The combined action of a number of different projects, cumulatively with the project being assessed, on a single resource/receptor (cumulative).
- 4.3.23. Further details on the scope of the cumulative effects assessment is provided in Chapter 15.

### Major Events

#### *Background*

- 4.3.24. The 2017 EIA Regulations introduced a requirement to consider major accidents and disasters. The general scope of the requisite assessment covers:



- Vulnerability of the project to risks of major accidents and/ or disasters (subsequently referred to as major events); and
- Any consequential changes in the predicted effects of that project on environmental topics.

#### *Methodology*

4.3.25. The assessment will:

- Apply professional judgement in consultation with the Overseeing Organisation to develop project specific definitions of major events;
- Identify any major events that are relevant to and can affect the proposed scheme;
- Where major events are identified, describe the potential for any change in the assessed significance of the project on relevant environmental topics in qualitative terms;
- Report the conclusions of this assessment within the individual environmental topics; and
- Clearly describe any assumed mitigation measures, to provide an evidence base to support the conclusions and demonstrate that likely effects have been mitigated/ managed to an acceptable level.

4.3.26. The potential receptors of effects resulting from major events and any consequences for receptors will be reported in the relevant ES topic chapter as required.

4.3.27. The methodology adopted for the assessment is described in the EIA Scoping Report.

### **Human Health**

#### *Scope of Assessment*

4.3.28. There is no consolidated methodology or practice for this topic, however, the NPSNN (paragraph 4.81) defines how significance of effects are to be determined, whilst the scope of the assessment is covered by existing Highways England guidance. The assessment to be undertaken as part of the EIA will address health in the first instance by utilising individual guidance for air quality, noise and vibration, road drainage and the water environment and people and community effects. To enable overall health conclusions to be drawn, a qualitative assessment of information collated via the topic assessments, taking into consideration the opinions (where applicable) of Public Health England, will then be undertaken and presented within the ES.

## 5. AIR QUALITY

### 5.1. Introduction

5.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on air quality. Receptors that are sensitive to air quality include public exposure receptors (these are sensitive locations where relevant exposure for the air quality criteria being assessed could occur e.g. residential properties or schools), and nationally and internationally designated ecological sites.

5.1.2. The approach to the assessment and the methods being used to identify potentially significant effects on air quality are set out in the M42 Junction 6 Improvement Scheme EIA Scoping Report<sup>16</sup>. In summary, the process of scoping identified that the construction and/or operation of the proposed scheme could result in the following:

- Fugitive dust emissions associated with construction related activities; and
- Emissions of nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) due to road traffic during the construction and operational phases of the proposed scheme.

5.1.3. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of air quality effects associated with highway-based improvements.

### 5.2. Stakeholder Engagement

5.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and records concerning air quality within the defined study area, and to develop the assessment scope.

5.2.2. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the air quality assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- An assessment of construction vehicles to identify their likely significance to inform the ES;
- The air quality assessment should consider non-designated ecological sites; and
- An assessment of impacts associated with increased PM<sub>2.5</sub>.

5.2.3. Consultation will continue with SMBC Environmental Health Officers (EHO) through the EIA process to: further refine the adopted study area (described below); discuss the magnitude of predicted impacts and the significance of effects on air quality; and agree appropriate mitigation measures.

### 5.3. Assessment Assumptions and Limitations

5.3.1. At the current time, no detailed construction or operational traffic flow data are available to inform the air quality impact assessment. Thus, this preliminary assessment of potential air quality impacts is necessarily qualitative. Further assessment of air quality impacts will be made and reported in the ES.

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<sup>16</sup> <https://infrastructure.planninginspectorate.gov.uk/projects/west-midlands/m42-junction-6-improvement/?ipcsection=docs>

5.3.2. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.

5.3.3. The findings of the preliminary assessment may be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further research and monitoring are undertaken to fully understand its potential effects.

## **5.4. Study Area**

5.4.1. The process of scoping identified that the air quality study area will be the 200m boundary of the roads that are determined to be affected by the proposed scheme in accordance with Highways England guidance. (See Figure 5.1).

## **5.5. Baseline Conditions**

5.5.1. The following tasks have been undertaken to date in the assessment to establish the baseline conditions that exist within the adopted study areas:

- A review of relevant legislation, planning policy and guidance concerning air quality;
- A desk based review of Ordnance Survey data, detailed address data and other web-based sources to identify sensitive receptors;
- A review of published studies undertaken to inform route optioneering and selection<sup>17</sup>; and
- A site visit (undertaken on 28<sup>th</sup> September 2017) to the 12 locations where air quality monitoring diffusion tubes have been installed (see Figure 5.2).

### **Receptor Locations**

5.5.2. A number of sensitive receptors within 200m of the Affected Road Network (ARN) have been identified within the study area. Such receptors have the potential to experience adverse air quality effects during proposed scheme construction and operation.

5.5.3. The majority of sensitive receptors located near to the proposed scheme are located in the village of Bickenhill, along Pitt Lane, along the B4438 Catherine De Barnes Lane, Clock Lane, Shadowbrook Lane and Solihull Road.

5.5.4. Within Bickenhill, Glebe Farm, Ivy Cottage, Harpsford and Church Garth are located on St Peters Lane to the north west of Church Lane, adjacent to the proposed new slip road on the eastern side of the proposed scheme. On Church Lane, there are a number of receptors, including St Peters Church, Church Farm, Green Court, Yew Tree Farm and Grove House. There are other receptors located on St Peters Lane to the south east of Church Lane, including Grange Farm and The Croft. On the southern section of St Peters Lane there are other receptors, including Ashdene and Goldenacres.

5.5.5. The Haven Caravan Park is to the north of Bickenhill on the B4438 Catherine De Barnes Lane. This has been designated as a Traveller's Site by SMBC. Further receptors are located on Clock Lane to the north.

5.5.6. Braceys Nursery is located to the south of Bickenhill along the B4438 Catherine De Barnes Lane. Braceys Nursery consists of a number of glasshouses for plants.

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<sup>17</sup> M42 Junction 6 Improvement Environmental Assessment Report (Stage 2 Option Identification) - HE551485-MOU-00-XX-PC-EN-00018 (May 2017)

Glasshouses are considered to be highly sensitive receptors to the effects of construction dust, as increases in dust deposition can lead to a reduction in light available to plants within the glasshouse. Four Winds is located to the west of the proposed scheme along the B4438.

- 5.5.7. There are a number of sensitive receptors located along Shadowbrook Lane to the east of the proposed scheme, including Plack Nurseries Travellers Site, Oak Tree Lodge, Swift Lodge and Heath Farm.
- 5.5.8. Heath End House is located at the junction between the B4438 and Shadowbrook Lane, however, the property would be demolished to facilitate the proposed scheme. As such, Heath End House has not been considered in the assessment.
- 5.5.9. To the north, Myrtle Cottage Farm is located adjacent to the proposed junction improvements at Junction 6, with Elm Gables and Rose Cottage in Middle Bickenhill slightly further to the north.
- 5.5.10. Further receptors located along the ARN will be identified once detailed traffic modelling has been concluded. This is considered likely to include receptors located in Kingshurst, Chelmund's Cross, Chelmsley Wood, Coleshill, Elmdon, Lode Heath, Catherine De Barnes, Hampton in Arden, Solihull and Copt Heath.

#### **Designated Ecological Sites**

- 5.5.11. Bickenhill Meadows SSSI is split into two units, both within 200m of the proposed scheme. One unit is located to the north of Shadowbrook Lane and to the east of the proposed scheme, adjacent to the Plack Nurseries Travellers Site, while the second unit is located to the west of the proposed scheme.
- 5.5.12. The River Blythe SSSI is located approximately 400m to the south of the proposed scheme, whilst the Coleshill and Bannerly Pools SSSI is located approximately 1.4km to the north. Both of these ecological sites are located adjacent to roads that are likely to be within the 200m of the ARN. Whether these ecological receptors are scoped into the air quality assessment will be confirmed following completion of detailed traffic modelling.

#### **Monitoring Data**

- 5.5.13. The national limit values for air quality pollutant concentrations with for NO<sub>2</sub> and PM<sub>10</sub> are 40µg/m<sup>3</sup> for both.
- 5.5.14. There is an Air Quality Management Area (AQMA) in the vicinity of the proposed scheme, located approximately 2km to the west of the existing M42 corridor. Birmingham City Council (BCC) has declared a city wide AQMA, covering the entirety of their administrative area due to the exceedance of the NO<sub>2</sub> annual mean air quality objective value, and the exceedance of the 24 hour mean limit value (BCC, 2016). North Warwickshire Borough Council (NWBC) had declared an AQMA around a section of the M42 and M6 to the south of Coleshill, but this AQMA was revoked in 2013 (NMBC, 2015).
- 5.5.15. Both SMBC (SMBC, 2016b) and NWBC (NWBC, 2015) have undertaken air quality monitoring at locations near to the study area. BCC 2016 has undertaken monitoring across their administrative area (2016), however, none of their monitoring locations are within the study area.
- 5.5.16. Monitoring undertaken by SMBC was decommissioned in 2012 and so the most recent air quality monitoring data relates to 2011. Monitoring results near to main roads, such

as along Coventry Road (A45), indicate that concentrations of NO<sub>2</sub> were well below the national limit value for NO<sub>2</sub> of 40µg/m<sup>3</sup>, whilst one monitoring location on Old Station Road near Junction 6 on the M42 had a reported NO<sub>2</sub> concentration slightly below the national limit value. This monitoring location was located within 5m of the Junction 6 roundabout and indicates that receptors located close to the M6 are at risk of exceeding the NO<sub>2</sub> annual mean limit value.

5.5.17. Monitoring undertaken by NWBC in Coleshill records NO<sub>2</sub> concentrations at relevant receptors consistently well below the national limit value of 40µg/m<sup>3</sup> at locations near to the interchange between the M6, M6 Toll and M42.

5.5.18. SMBC and NWBC air quality monitoring results in the vicinity of the proposed scheme are provided in Table 5.1.

**Table 5.1: Trends in NO<sub>2</sub> concentrations**

Site ID	Site Name	Site Type	Distance to proposed scheme (km)	Annual Mean NO <sub>2</sub> concentrations (µg/m <sup>3</sup> )				
				2010	2011	2012	2013	2014
<b>Solihull Metropolitan Borough Council</b>								
19	Partridge Close	Roadside	4.5	- <sup>a</sup>	28.6	- <sup>a</sup>	- <sup>a</sup>	- <sup>a</sup>
20	Blackfirs	Suburban	2.5	- <sup>a</sup>	22.5	- <sup>a</sup>	- <sup>a</sup>	- <sup>a</sup>
21	Old Station Road	Roadside	1	- <sup>a</sup>	39.7	- <sup>a</sup>	- <sup>a</sup>	- <sup>a</sup>
<b>North Warwickshire Borough Council</b>								
6	Coventry Road, Coleshill	Roadside	4.5	33	28	34	31	31
7	Coleshill School	Roadside	5	29	23	28	25	24
8	Packington Lane, Coleshill	Roadside	5	28	22	27	24	22
11	AQMA Farmhouse (Gate)	Roadside	4	39	33	38	38	35

<sup>a</sup> No monitoring undertaken at this time

5.5.19. Table 5.1 indicates that measured NO<sub>2</sub> concentrations have shown a range of variation over the last five years in and close to the study area, although concentrations vary

from year to year depending on meteorological conditions. No monitoring location reported a concentration above the 40 µg/m<sup>3</sup> national limit value for NO<sub>2</sub>.

5.5.20. Highways England monitoring of NO<sub>2</sub> using diffusion tubes undertaken between 2013 and 2016 was conducted at six locations in proximity to the proposed scheme. Table 5.2 presents the results from the monitoring programme.

**Table 5.2: Highways England NO<sub>2</sub> Diffusion Tube Monitoring in Proximity to the Proposed Scheme (2013 - 2016)**

Site ID	Site Type	Grid Reference		Annual Mean NO <sub>2</sub> Concentration (µg/m <sup>3</sup> )			
		X	Y	2013	2014	2015	2016
M42J3AJ5_007_0813 Warwick Road	Roadside <sup>a</sup>	416921	278428	28.0	26.2	- <sup>b</sup>	- <sup>b</sup>
M6J2J4_037_0513 Coventry Road	Roadside <sup>a</sup>	420012	287273	52.1	49.0	- <sup>b</sup>	- <sup>b</sup>
M6J2J4_040_0513 142 Cornfield Croft	Roadside <sup>a</sup>	418851	287187	32.8	34.1	- <sup>b</sup>	- <sup>b</sup>
BBP4_001_0116 Chester Road	Roadside <sup>a</sup>	420024	284970	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	29.6
BBP4_002_0116 East Way	Roadside <sup>a</sup>	420281	283176	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	26.5
BBP4_003_0116 Church Lane	Roadside <sup>a</sup>	419283	282932	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	24.7
BBP4_004_0116 Old Station Road	Roadside <sup>a</sup>	419854	282851	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	32.2
BBP4_005_0116 St Peters Lane	Roadside <sup>a</sup>	418892	282217	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	17.5
BBP4_006_0116 Shadowbrook Lane	Roadside <sup>a</sup>	419564	281289	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	20.8
BBP4_007_0116 Warwick Road	Roadside <sup>a</sup>	416857	278508	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	27.9
BBP4_008_0116 Warwick Road	Roadside <sup>a</sup>	416812	278547	- <sup>b</sup>	- <sup>b</sup>	- <sup>b</sup>	21.8

<sup>a</sup> Classification for sites within 1 m and 5 m from the kerb, as defined in Defra Technical Guidance (TG16)

<sup>b</sup> No monitoring undertaken at this time

5.5.21. In addition to the above, as part of the air quality assessment for the proposed scheme, a twelve month monitoring survey is being undertaken (September 2017 to February 2018) for robustness of data collection, with the first 6 months being used to inform the air quality assessment. This monitoring programme aims to reconfirm existing monitoring data and provide additional data at sensitive receptor locations near to the

route of the proposed scheme. Monitoring locations are detailed in Table 5.3 and illustrated in Figure 5.2.

**Table 5.3: September 2017 to February 2018 Air Quality Monitoring Locations**

Site ID	Description	Grid Reference	
		X	Y
M42_001	142 Cornfield Croft, Chelmsley Wood	418851	287187
M42_002	Coventry Road, Coleshill	420012	287273
M42_003	Old Station Road/M42 Junction 6 Roundabout	419849	282926
M42_004	Old Station Road	419854	282851
M42_005	1 Clock Lane, Bickenhill	418505	282884
M42_006	The Haven Caravan Park, B4438 Catherine De Barnes Lane, Bickenhill	418574	282476
M42_007	Glebe Farm, St Peters Lane, Bickenhill	418662	282416
M42_008	Bracey's Nursery and Garden Centre, B4438 Catherine De Barnes Lane, Bickenhill	418533	281791
M42_009	Four Winds, B4438 Catherine De Barnes Lane	418435	281234
M42_010	B4102 Hampton Lane, Catherine De Barnes	418082	280449
M42_011	B4102 Solihull Road	419251	280628
M42_012	3 High Street, Hampton in Arden	420320	280868
M42_013	Warwick Road, Solihull	416857	278508
M42_014	Warwick Road, Solihull	416921	278428

### Background Data

5.5.22. In addition to the available monitoring data, annual average background pollutant data for each 1km x 1km grid square within the vicinity of the proposed scheme have been sourced from the Defra 2013 Background Pollution Maps (DEFRA, 2016b). Data for the baseline year 2017, proposed scheme construction year 2020 and opening year 2023 have been used. Contributions from motorways, trunk roads and A roads have been removed from each grid square using Defra's NO<sub>2</sub> Adjustment for NO<sub>x</sub> Sector Removal Tool, as these contributions will be explicitly modelled as part of the air quality impact assessment to be included in the ES. The mean, maximum and minimum concentrations of NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> for the grid squares that encompass the proposed scheme are shown in Table 5.4.

5.5.23. Table 5.4 indicates that background pollutant concentrations in the vicinity of the proposed scheme are well below the national limits values for the respective pollutants, with all maximum concentrations less than half of their respective limit values.

**Table 5.4: Background Pollutant Concentrations from Defra Background Maps**

	Background Pollutant Concentration ( $\mu\text{g}/\text{m}^3$ )*											
	2017				2020				2023			
	NO <sub>x</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	NO <sub>x</sub>	NO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
<b>Mean</b>	24.1	16.8	16.6	11.4	20.2	14.3	16.2	11.1	18.6	13.3	16.1	11.0
<b>Maximum</b>	29.4	19.9	17.6	11.9	24.5	17.0	17.2	11.6	22.6	15.8	17.2	11.5
<b>Minimum</b>	21.6	15.3	15.0	10.7	18.1	13.0	14.6	10.3	16.7	12.1	14.5	10.2

\* Concentrations reported are after removal of contributions from Motorways, trunk A roads and A roads

## 5.6. Potential Impacts

5.6.1. An assessment of the sensitive receptors, the type and magnitude of impact likely to arise during the construction and operational phases of the proposed scheme, and the significance of effect(s) will be undertaken in accordance with methodology and criteria presented in the EIA Scoping Report as referenced herein. The results from the assessment will be reported in full in the ES. Given that detailed traffic modelling has not yet been completed, the preliminary assessment presented below is necessarily qualitative.

### Potential Impacts: Construction Phase

#### *Construction Dust Emissions*

5.6.2. During the proposed scheme construction phase, there is the potential for adverse impacts from dust emissions from construction activities at sensitive receptors within the vicinity of the construction site and access roads. The types of activities with the potential to generate dust during the proposed scheme construction phase include:

- Movement of vehicles;
- Enabling works (e.g. verge clearance);
- Earthworks;
- Minor demolition (e.g. concrete bases and footings);
- Excavation and installation of drains and communication ducts;
- Construction of retaining walls etc.;
- Surfacing works;
- Central reserve works;
- Installation of verge furniture and planting vegetation; and
- Stock piling/ storage.

5.6.3. There are a number of receptors within 200m of the proposed construction works (refer to Section 5.5), and thus mitigation measures would be required in order to reduce the risk of possible dust impacts. Receptors located on St Peters Lane to the north west of Church Lane, and along the B4438 Catherine De Barnes Lane to the south of Bickenhill are located adjacent to the proposed construction corridor, and specific, targeted dust mitigation measures would be required in these areas in order to minimise the potential for adverse impacts.



- 5.6.4. Details of the construction phase mitigation measures likely to be required are provided in Section 5.7.

*Construction Traffic Emissions*

- 5.6.5. During the proposed scheme construction phase, it is likely there would be additional vehicle movements due to HGVs accessing the construction site from the surrounding road network, and potential vehicles on haul roads within the construction site. Such vehicles have the potential to increase concentrations of pollutants at receptors near to the ARN and haul roads, specifically NO<sub>2</sub> and PM<sub>10</sub>.

- 5.6.6. Details of the construction phase mitigation measures targeting construction traffic emission are detailed in Section 5.7.

- 5.6.7. A detailed assessment of the impacts due to construction related traffic will be undertaken and included in the ES - the level of assessment required will depend on the total construction vehicle requirements and associated management practices proposed by the construction contractor.

*Construction Phase Traffic Management*

- 5.6.8. The proposed scheme would involve a number of works on the M42, Junction 6 of the M42, the A45 and to land to the immediate west of the M42. During these works, there are likely to be changes in traffic flows on existing roads due to speed restrictions, lane and slip road closures, and vehicle re-routing, requiring traffic management on the road network. At this time, the extent of the traffic management required is not known – thus further assessment work will be undertaken during the EIA and reported in the ES using estimates provided by the construction contractor and traffic consultants.

**Potential Impacts: Operation Phase**

- 5.6.9. The changes to the road network have the potential to produce changes in NO<sub>2</sub> and PM<sub>10</sub> concentrations at receptors in the vicinity of the proposed scheme route, and in the wider study area near the ARN.

- 5.6.10. The greatest potential change is likely to be at receptors in the area around Bickenhill, as new traffic would be introduced along the proposed scheme. Air quality in this area is currently very good, with pollutant concentrations well below the national air quality objective values (40µg/m<sup>3</sup> for both NO<sub>2</sub> and PM<sub>10</sub>). It is currently considered very unlikely that air pollutant concentrations due to the proposed scheme would increase sufficiently to be above national limit values for either NO<sub>2</sub> or PM<sub>10</sub>, although this will be confirmed in the ES.

- 5.6.11. At receptors located within 200m of the ARN, the changes in traffic flow due to the proposed scheme are less certain at this point, and the likely changes in pollutant concentration are correspondingly uncertain. The proposed scheme is being designed to ease congestion around Junction 6, and it would be expected that there would be a decrease in pollutant concentrations at receptors in this vicinity. Beyond these junctions modifications, the changes in traffic flow are likely to be marginal (either a slight increase or a slight decrease), and the changes in pollutant concentrations are subsequently expected to be marginal.

- 5.6.12. The degree to which the predicted changes in operational traffic flows due to the proposed scheme would change pollutant concentrations will be assessed and reported in the ES, using detailed traffic modelling data.

## 5.7. Design, Mitigation and Enhancement Measures

5.7.1. Environmental considerations have been taken into account during the development of the proposed scheme design, in order to reduce and/ or avoid potential air quality impacts. This iterative approach has led to a range of mitigation measures capable of reducing the magnitude of impacts being embedded within the proposed scheme design or captured within the proposed construction practices.

### Construction Phase

5.7.2. During the proposed scheme construction phase, Section 5.6 indicates that there is the potential for changes in air quality due to dust emissions from construction activity, emissions from construction traffic, and from changes in traffic flows along the proposed scheme and wider road network with traffic management in place.

5.7.3. Standard dust mitigation measures that may be implemented during the proposed scheme construction phase are presented in Table 5.5. Such activities would be undertaken by the appointed contractor, and in line with measures set out in their CEMP. The routes that construction vehicles should take would be detailed within the contractors CEMP – such vehicles would likely be restricted to the major roads in vicinity of the proposed scheme. This would help restrict the potential for air quality impacts at identified receptors.

**Table 5.5: Standard Construction Phase Dust Mitigation Measures**

Mitigation	Mitigation Measures
Mitigation for all site: dust management	<b>Dust Monitoring</b>
	Monitoring may include monitoring of dust deposition, dust flux, real-time PM <sub>10</sub> continuous monitoring and/ or visual inspections. Undertake daily on-site and off-site inspections, where receptors are nearby, to monitor dust, record inspection results, and make the log available to the local authority etc. when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
	<b>Preparing and Maintaining the Site</b>
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Keep site fencing, barriers and scaffolding clean using wet methods where there is the risk of dust accumulation.
	Remove materials that have the potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover, seed or fence stockpiles to prevent wind whipping.
	<b>Operating Vehicle/ Machinery and Sustainable Travel</b>

	<p>Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided).</p> <p>Ensure all vehicles switch off engines when stationary - no idling vehicles.</p> <p>All construction plant should use fuel equivalent to ultra-low sulphur diesel (ULSD) where possible.</p> <p><b>Operations</b></p> <p>Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.</p>
<b>Demolition</b>	See Table 5.6.
<b>Surfacing works</b>	Surfacing equipment (e.g. planer) only to be operated with any manufacturers dust abatement measures in place.
<b>Construction</b>	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
<b>Trackout</b>	Use water-assisted dust sweeper(s) on access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Record all inspections of haul routes and any subsequent action in a site log book.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site) where reasonably practicable.

5.7.4. Where standard dust mitigation measures as detailed in Table 5.6 may not be sufficient to minimise potential air quality impacts, the additional mitigation measures as presented in Table 5.6 are proposed.

**Table 5.6: Additional Air Quality Mitigation Measures**

Mitigation	Mitigation Measures
<b>Mitigation for all site</b>	<p>During the proposed scheme construction phase, appropriate mechanisms to communicate with local residents would be set up to highlight potential periods of disruption (e.g. web-based, newsletters, newspapers, radio announcements etc.). An information web-page would be provided and kept up-to-date on the Highways England website to reflect construction and community liaison requirements. It is envisaged that the web-page would provide up-to-date information on the progress of the construction works, areas affected by construction, mitigation in place to reduce adverse effects, information regarding planned construction works (including any proposed works outside normal hours) and works recently completed. The communication strategy would minimise the likelihood of complaints. Residents would be provided with a point of contact for any queries or complaints.</p>
	<p>Display the name and contact details of person(s) accountable for air quality and dust issues on the construction site boundaries. This may be the environment manager/ engineer or the site manager.</p>
	<p>Display the head or regional office contact information.</p>
<b>Mitigation for all site: dust management</b>	<p><b>Site Management</b></p>
	<p>Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.</p>
	<p>Make the complaints log available to the local authority etc. as soon as reasonably practicable.</p>
	<p>Record any exceptional incidents that cause dust and/ or air emissions, either onsite or offsite, and the action taken to resolve the situation in the log book.</p>
	<p>Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. In particular, it is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes.</p>
	<p><b>Monitoring</b></p>
	<p>Carry out regular site inspections to monitor the effectiveness of mitigation measures, record inspection results, and make an inspection log available to the local authority etc. promptly upon request.</p>
<p>Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.</p>	

	Undertake dust deposition, dust flux, or real-time PM10 continuous monitoring. Wherever possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences.
	<b>Preparing and Maintaining the Site</b>
	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers around particularly dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Avoid site runoff of water or mud.
	<b>Operating Vehicle/ Machinery and Sustainable Travel</b>
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
	Manage the sustainable delivery of goods and materials through careful programming of delivery.
	Implement a travel plan that supports and encourages sustainable travel (e.g. public transport, cycling, walking, and car-sharing).
	<b>Operations</b>
	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction (e.g. suitable local exhaust ventilation systems).
	Ensure an adequate water supply on the site for effective dust/ particulate matter suppression/ mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	<b>Waste Management</b>
	Avoid bonfires and burning of waste materials.
<b>Demolition</b>	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.

	Avoid explosive blasting where possible, using appropriate manual or mechanical alternatives.
	Comply with measures set out in the Asbestos Management Plan (refer to Section 9.7).
<b>Earthworks</b>	Re-vegetate earthworks and exposed areas/ soil stockpiles to stabilise surfaces as soon as practicable.
	Use hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
	Only remove the cover in small areas during work and not all at once.
<b>Construction</b>	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overflowing during delivery.
	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
<b>Trackout</b>	Maintain and inspect on-site haul routes for integrity and operate a programme of routing maintenance and where necessary carry out repairs to the surface as soon as reasonably practicable.
	Install hard surfaced haul routes if possible, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and are regularly cleaned.
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
	In locations without hard standing it may be necessary to clean the vehicle bodies in addition to wheels.
	Access gates to be located at least 10m from receptors where possible.

5.7.5. Locations considered to be higher risk of construction phase air quality effects, and therefore requiring the application of additional mitigation measures as detailed in Table 5.6, are those with sensitive receptors (residential properties) close to the works i.e. within 200m. There are residential properties in close proximity to the proposed scheme, and therefore it is likely that these additional mitigation measures would be required across the majority of the construction area.

5.7.6. The mitigation measures listed in Table 5.5 and Table 5.6 are based on those presented by the Institute of Air Quality Management (IAQM) in their guidance on the assessment of dust from demolition and construction sites (Institute of Air Quality Management, 2017).

5.7.7. The final selection of the most appropriate mitigation measures, including specific mitigation measures as related to construction phase HGV movements and

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construction phase traffic management, will be reconsidered during the EIA and reported in the ES, taking advice from a construction contractor.

### **Operation Phase**

- 5.7.8. No air quality mitigation measures are proposed during the proposed scheme construction phase. Further assessment of air quality impacts associated with proposed scheme operation will be undertaken once detailed traffic modelling is completed. This will inform the proposed scheme design process and identify if specific operational measures are necessary.

## **5.8. Assessment of Effects**

- 5.8.1. The preliminary air quality impact assessment indicates that there are a number of sensitive receptors in the vicinity of the proposed scheme, mainly those along St Peters Lane in Bickenhill and along the B4438 Catherine De Barnes Lane.
- 5.8.2. Some receptors are located adjacent to the proposed scheme site boundary, or near to construction activities – standard and specific construction mitigation measures would be required during the construction phase in order to reduce risks associated with dust. Further work will be undertaken as part of the assessment to develop, refine and agree possible operational mitigation measures for air quality. Once established and agreed with relevant statutory bodies, an assessment will be made of the role such measures would have in mitigating the air quality effects to reduce their potential significance.
- 5.8.3. These receptors are also likely to experience the greatest change in pollutant concentrations during the operational phase of the proposed scheme, due to the introduction of new traffic along the route. As air quality is of a good quality in the vicinity of the proposed scheme, it is unlikely that the proposed scheme would contribute to a worsening of air quality considered significant at sensitive receptors – these preliminary findings will be confirmed through detailed air quality modelling using traffic data and reported in the ES.

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## 6. CULTURAL HERITAGE

### 6.1. Introduction

- 6.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on cultural heritage assets. Assets comprise designated and undesignated buildings, monuments, sites, places, areas and landscapes which are considered to be of heritage interest or significance.
- 6.1.2. The approach to the assessment and the methods being used to identify potentially significant effects on cultural heritage are set out in the M42 Junction 6 Improvements EIA Scoping Report. In summary, the process of scoping identified that the construction and/ or operation of the proposed scheme could result in the following:
- the partial or total removal of heritage assets;
  - the compaction of archaeological deposits by construction traffic and structures;
  - changes in groundwater levels leading to the desiccation of waterlogged archaeological deposits;
  - effects on the setting of heritage assets (for example from visual and noise intrusion); and
  - severance and impacts on amenity as a result of construction works.
- 6.1.3. Scoping also identified potential for unrecorded (buried) archaeology to be impacted during construction, and for the proposed scheme to introduce new highway infrastructure in proximity to conservation areas.
- 6.1.4. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of cultural heritage effects associated with highway-based improvements.

### 6.2. Stakeholder Engagement

- 6.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and records concerning cultural heritage assets within defined study areas, and to develop the assessment scope.
- 6.2.2. Consultation will continue with Historic England, SMBC and the relevant County Archaeologist(s) through the EIA process to: further refine the adopted study areas (described below); discuss the magnitude of predicted impacts and the significance of effects on cultural heritage; and agree appropriate mitigation measures.

### 6.3. Assessment Assumptions and Limitations

- 6.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.
- 6.3.2. The findings of the preliminary assessment may be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further research and investigative surveys are undertaken to fully understand its potential effects.

### 6.4. Study Area

- 6.4.1. The process of scoping identified that a 1km study area around the proposed scheme boundary would be appropriate to identify any potential effects on designated heritage assets and their settings.



6.4.2. For non-designated assets, scoping concluded that a 500m study area would be sufficient.

## **6.5. Baseline Conditions**

6.5.1. The following tasks have been undertaken to date in the assessment to establish the baseline conditions that exist within the adopted study areas.

- A review of relevant legislation, planning policy and guidance concerning the conservation and protection of archaeological resources, built heritage assets and historic landscapes;
- Desk-based review of archaeological and built heritage records obtained from third party sources including: the National Heritage List; Solihull Historic Environment Record (HER); Warwickshire Records Centre; Ordnance Survey mapping; aerial photography; and other web-based information sources;
- A review of published studies undertaken to inform route optioneering and selection at PCF Stage 2; and
- A site visit (undertaken on 3rd and 4th October 2017) to: assess the condition of known heritage assets; establish the potential for unrecorded heritage assets within the proposed scheme boundary; and to assess the current setting of designated heritage assets.

6.5.2. A list of designated and non-designated heritage assets have been provided within Appendix 6.1 and 6.2.

### **Historic Landscape Character**

6.5.3. The desk-based review and site visits have established that the local area has remained rural in character and is dominated by agricultural uses. There has been a degree of urbanisation attributed to the development of transportation infrastructure associated with Birmingham International Airport and the M42 motorway corridor.

6.5.4. A total of 110 entries exist in the record of Historic Land use Characterisation in the Solihull Historic Environment Record, the majority of which reflect the over-riding rural nature of the local area. These identify that many fields are of varying size and have medieval origins, and are characterised by irregular or 'S' shaped boundaries. Some of the fields bear the hallmarks of enclosure, and at least two record the historic core of Bickenhill and Middle Bickenhill with others relating to Hampton in Arden.

6.5.5. Two areas of replanted ancient woodland are recorded: Barber's Coppice; and Aspbury's Copse. Two farmsteads with historic origins are also listed: Hampton Land Farm, which has potential for 17th century origins; and Walford Hall Farm, which has medieval origins and is the site of a moated settlement.

### **Heritage Assets**

6.5.6. The desk-based review of available records confirms the following:

- No World Heritage Sites or Historic Battlefields are present within the 1km study area;
- No registered parks and gardens, or non-designated parks and gardens are located within the 500m study area;
- Three designated archaeological assets (Scheduled Monuments) are recorded within the 1km study area (comprising a Moated site at Moat House, a Moated site

- at Eastcote Hall, and the Churchyard cross in St Mary and St Bartholomew's churchyard);
- 78 non-designated archaeological assets are recorded within the 500m study area, comprising different types of asset dating from the prehistoric period to modern day.
  - Two Conservation Areas within the 1km study area (comprising Hampton in Arden Conservation Area and Bickenhill Conservation Area);
  - A total to two Grade I, six Grade II\* and 19 Grade II listed buildings within the 1km study area, many of which are located within the two Conservation Areas; and
  - A total of 23 non-designated built heritage assets within the 500m study area.
- 6.5.7. Each asset is described in more detail below, and are categorised by period. Each asset has a unique record number (indicated in brackets) which cross-relates to their location as shown on Figure 6.1 to 6.4.

### **Archaeology**

#### *Prehistoric (to 43 AD)*

- 6.5.8. The prehistory of the area is fairly well represented with numerous finds and sites recorded, including hand-axes, worked flints and settlement/occupation evidence from the Palaeolithic to the Iron Age.
- 6.5.9. There are 13 assets dating to the prehistoric period, the earliest of which date to the Neolithic period (10,000 to 4,000 BC) and comprise: various enclosures and field systems identified by cropmarks (6960, 9062, 9902, 10837, 10832); a ditch (10833); a lynchet (5663); and earthworks of a boundary bank (5728).
- 6.5.10. A single Mesolithic (10,000 to 4,000 BC) flint blade is recorded as a find spot (14004), and a single Bronze Age (2,350 to 800 BC) palstave was identified by metal detecting (1639). Two Iron Age (800 BC to 43 AD) assets consist of the Salter Street trackway (1376) and circumstantial place-name evidence for defences north of Walford Hall Farm (10834).
- 6.5.11. A flint scatter of prehistoric date was also recorded by fieldwalking east of the M42 and south of Friday Lane (1745).

#### *Roman (43 to 450 AD)*

- 6.5.12. The Roman period is well understood in the wider locality surrounding the study area. Two major Roman roads (Watling Street and the Fosse Way) run through the county, and there are numerous examples of occupation, industrial and military sites as well as recovered objects representative of the period.
- 6.5.13. There are three assets of Roman date, all of which are find spots and consist of a ceramic vessel (1814) and two single sherds (5672; 1734) identified during fieldwalking.

#### *Early Medieval (450 to 1066 AD)*

- 6.5.14. There is less evidence within the county for the early medieval period compared to the Roman period. A number of religious sites such as monasteries and churches are recorded in the wider locality surrounding the study area, along with evidence of mortuary activity. Settlement activity is also recorded and includes sites at Wolfhampcote and Cherry Orchard.

6.5.15. There are two assets of early medieval date recorded in the study area: a deserted village at Bickenhill (10503) which probably originated in the early medieval period as 'Bichehelle' (Bica's Hill) and had ceased to exist by 1785; and an old trackway and ford over Holywell Brook, Middle Bickenhill (10829).

*Medieval (1066 to 1500 AD)*

6.5.16. The medieval period is well represented in the records for the Warwickshire region, with a wide variety of activities and monument types present including churches, halls, manor houses, castles, parklands, deserted medieval villages, monasteries and schools.

6.5.17. Within the study area there are 44 assets of medieval date.

6.5.18. Three find spots (1593; 1675; 1428) include coins, strap fittings, and a harness fitting.

6.5.19. Thirty assets record agricultural and quarrying activity in the form of ridge and furrow and various industrial pits (5660; 10835; 5797; 5664; 5761; 5787; 5794; 5798; 5802; 10926; 5726; 10974; 9066; 10975; 8585; 8587; 8588; 8586; 5801; 5800; 5799; 9061; 5804; 5803; 5795; 5796; 9060; 5792; 5793; 5796).

6.5.20. The settlement site at Middle Bickenhill (10504), comprising a manor house and settlement was founded as a secondary colony settlement to that at Bickenhill, near to its early medieval counterpart (10503). Two trackways are associated with the settlement at Bickenhill, one being a holloway visible as earthworks between Bickenhill and Meriden (5727) and the other being the line of an old road between Bickenhill, Stonebridge and Meriden (10828).

6.5.21. There is documentary evidence for a medieval settlement at Catherine De Barnes (5822), with a further settlement visible as earthworks at Church Bickenhill (6198).

6.5.22. A record for the possible remains of the manor house associated with the settlement at Church Bickenhill (10506), although the evidence is circumstantial. The centre point of the medieval parish of Bickenhill is also recorded (10499).

6.5.23. A record exists for a moated site (10493) next to Walford Hall Farm. The listed manor house was built next to this earlier moated site, and the record suggests it was a separate moated manor house.

6.5.24. Two of the three designated Scheduled Monuments within the study area are also moated sites. The first, at Moat House (1017243), encloses a complex and sits within a landscape formerly part of the Forest of Arden manorial. The second, at Eastcote Hall (1017529), includes the buried and earthworks remains of a moated site. A medieval or post-medieval windmill is recorded east of Hurdle Hall Farm (3118).

6.5.25. The remains of a medieval cross are recorded in the churchyard of St Mary and St Bartholomew's churchyard (1017815), and comprises the third designated Scheduled Monument within the study area.

*Post-Medieval (1500 to 1900 AD)*

6.5.26. There are 12 assets of post-medieval date within the study area; these primarily relate to the agricultural use of the landscape with 19th century transport links also recorded.

6.5.27. The agricultural assets include a series of slight earthwork remains indicating building platforms, holloways and ridge and furrow (1470031). The earthworks of a farmhouse and rabbit warren (5668) area also recorded, along with a series of pits which are possibly related to industrial activities (5757; 5758), although other uses cannot be

discounted. The remains of Pendigo Farm have been recorded under the Birmingham NEC (10535).

- 6.5.28. Three assets relate to the increasing transport links in this area. These comprise two railway lines (1363576; 1366099) constructed in 1838 and 1839, and an old road which follows the alignment of Gorse Lane (10827).
- 6.5.29. Other sites comprise two find spots that include five coins, a crotal and a buckle (1569; 1466), and two demolished buildings east of Hampton Lane Farm (10836).
- 6.5.30. The final site comprises a field known as Parson's Piece Field (1842), which may indicate an ecclesiastical site.

*Modern (1900 AD to present)*

- 6.5.31. Three recorded assets of modern date have been identified within the study area. The earliest is the Bickenhill Landing Grounds used for flying circuses in 1933 and 1936 (1855). The other two sites relate to World War II, and comprise: a Second World War Starfish Bombing Decoy SF2E at Bickenhill (1841), which formed part of the defences of the industrial area of Birmingham and was a prime bombing target during the war; and the Birmingham and Edmdon Airport (1395007), which was also used during World War II.

*Unknown*

- 6.5.32. Seven assets of unknown date are recorded in the study area. Three possible quarries (5665; 5666; 5667) relate to material extraction, which are most likely to be of post-medieval or modern date.
- 6.5.33. Cropmarks of unknown date are also recorded. Although these could date to any period, they may be of later prehistoric date based on their form. These comprise: an enclosure or settlement north-east of Woodhouse Farm, Bickenhill (9063); a circular enclosure and ploughed out mound south of Shadow Brook Lane, Hampton in Arden (5661); a possible rectangular cropmark north of Bickenhill Lane, Hampton in Arden (5419); and circular features at Hampton in Arden (5409).
- 6.5.34. Given the high proportion of recorded archaeological assets, potential exists for previously unrecorded buried historic remains to be presented within the study area.

**Built Heritage**

*Hampton-in-Arden Conservation Area*

- 6.5.35. Hampton-in-Arden was established by the Domesday Survey in 1086, recorded as Hartene and as having a church and a mill. The historic core of the village of Hampton in Arden, which largely comprises the village area west of the Rugby to London Railway Line, is covered by the Hampton in Arden Conservation Area which was designated by Warwickshire County Council in 1969.
- 6.5.36. Views from within the conservation area are largely inward looking, with some views towards open agricultural land to the south-west from the south of the area. Despite its proximity to the M42 and Birmingham International Airport, the conservation area remains rural in character and its historically isolated rural setting is tangible.
- 6.5.37. The conservation area contains the following listed buildings (within the 1km study area):

- The grade I listed parish Church of St Mary and St Bartholomew (National Heritage List for England (NHLE) 1055777) - established in the 12th century, with successive phases dated to the 13th to 16th centuries. The church is set within a churchyard (which also contains the Grade II listed and Scheduled Churchyard Cross (NHLE 1076764, 1017815)), on an area of higher ground overlooking the village to the south and east. The setting of the church comprises the wider village, being designed to be a prominent feature of the landscape.
- The grade II\* listed Moat House (NHLE 1057655) - a large timber framed house dated to the 16th century, with a later red brick phase of the 17th century;
- The grade II\* listed Clock Tower attached to Hampton Manor (NHLE 1261972), of ashlar construction with an octagonal roof and lantern in a Tudor revival style, built in 1872 by W. E. Nesfield;
- The grade II listed Hampton Manor (NHLE 1055754);
- The grade II listed mid-19th century garden terraces, walls and steps (NHLE 1342867) at Hampton Manor;
- The grade II listed 17th century Church Farmhouse (NHLE 1076769);
- The grade II listed 17th century White Lion Public House (NHLE 1055786);
- The grade II listed row of red brick cottages at 22-30 High Street (NHLE 1076762);
- The grade II listed Fentham Club (NHLE 1342829);
- The grade II listed Lodge, at Hampton Manor (NHLE 1076765);
- The grade II listed contemporary Manor Cottage (NHLE 1055725);
- The grade II listed 32-42 High Street (NHLE 1076763); and
- The grade II listed K6 telephone box (NHLE 1393163).

6.5.38. Non-designated built heritage assets within the Conservation Area (and within the 500m study area) comprise:

- Yew Tree Cottage (NHLE 1342866), constructed of timber framing with noggin and gabled dormers;
- A single building in the village dates to the 17th century and comprises Adkin Cottage (18/309), a timber framed and white washed cottage; and
- 77 and 79 High Street (NHLE 1055732), which comprises an early timber framed structure with noggin, though with considerable alterations dated to the 19th century.

#### *Bickenhill Conservation Area*

6.5.39. Bickenhill is of early-medieval origins, and the historic core of the village is contained within the Bickenhill Conservation Area. The village is located on flat ground and retains its historic agricultural character with a good survival of historic buildings of a vernacular character. Surviving buildings in the village are of historic and architectural interest, and their character and appearance contribute positively to the significance of the conservation area.

6.5.40. The village is largely well screened by vegetation; however, the wider landscape is evident particularly the proximity of Birmingham Airport where air traffic significantly detracts from the historic character of the village. Noise from the nearby road connections is less intrusive, but does detract from the sense of place. The historic agricultural setting of the village remains tangible when approaching the village from St Peter's Lane and Church Lane.

6.5.41. The conservation area contains the following listed buildings (within the 1km study area):

- The grade I listed Church of St Peter (NHLE 1343224), constructed in the 12th century with later phases dates to the 14th, 15th and 17th centuries. The setting of the church comprises the village of Bickenhill and the wider surrounding countryside. Views towards the church from within the village are limited due to the enclosed nature of the settlement, due to the prevalence of narrow lanes bounded by mature vegetation.
- The grade II listed Grange Farmhouse (NHLE 1075949).

6.5.42. Non-designated built heritage assets within the conservation area (and within the 500m study area) comprise:

- Glebe Farm (1894, 10542) on St Peter's Lane originates in the 16th or 17th century, and comprises a timber framed farmhouse encased in 19th century brick;
- The 17th century Croft (10534) on St Peters Lane, comprising a timber framed farmhouse extensively refaced in red brick;
- Grange Farmhouse's South Barn (10539), a 17th century timber framed barn with whitewashed noggin, is amongst non-designated assets in the conservation area;
- Yew Tree Farmhouse (1889), Church Farmhouse (10532) and a Barn (10538) at Church Farm, collectively located on Church Lane;
- Rose Bank (10540), on St Peter's Lane, is dated to the late 18th or early 19th century and comprises a colourwashed pebbledashed house with modern box dormers;
- Hazel Cottage (10541) on St Peters Lane is of 19th century date and is atypical of the vernacular character of the buildings within the conservation area;
- Harpsford (10543) comprises a 19th century dwelling, converted from a former stable; and
- The vicarage (10533) is 19th century and is of a more polite style atypical of the vernacular tradition.

*Other Heritage Assets outside the Conservation Areas*

6.5.43. The following listed buildings have been identified as being located outside the conservation areas but within the 1km study area:

- Adjacent to the A452 is the grade II\* listed (NHLE 1367098) Park Farmhouse. The farmhouse is dated to the late 18th or early 19th century, and is constructed in a gothic style with stuccoed facades. Of note are crowstepped gables, crenelated parapets and a crenelated porch. The farmhouse is enclosed to the west by existing farm buildings which contribute to its significance as a farm complex. Associated agricultural land similarly contributes to the ability to understand the significance of the asset;
- The grade II\* listed Walford Hall Farmhouse (NHLE 1342830) comprises a 15th century hall house modified in the 16th century by the insertion of a first floor. The farmhouse is constructed of timber frame and noggin, on stone foundations, with partial refacing in red brick. The farmhouse is located amongst a group of historic and modern farm buildings, and is partially screened towards the north and east by mature vegetation;

- The grade II\* listed Bogay Hall was built c.1500 with later additions dated from its stacks as of 1883, the house is constructed of close set timber frame with whitewashed plaster infill. Of note are ornate Tudor style stacks;
- The grade II\* listed Eastcote Hall (NHLE 1393163) is located on the western periphery of Eastcote. The house is dated to the 15th century, and includes the remains of a two bay hall. The building is constructed of close set timber framing with whitewashed plaster infill, with ornate 16th century red brick stacks;
- The grade II listed pebbledashed dovecote at Eastcote Hall (NHLE 1045901) is separately listed, as it has group value with the hall;
- The grade II listed Eastcote House (NHLE 1343230) is located inside the historic core of the settlement;
- Opposite Eastcote House of Barston Lane is the grade II listed Eastcote Manor (NHLE 1253299), built late in the 16th century and constructed of close set timber frame with white washed plaster infill;
- Neighbouring grade II listed Wharley Hall (NHLE 1075967) is dated to 1669 and constructed in a polite style of red brick with a hipped tiled roof and pilasters;
- A grade II listed 17th century barn (NHLE 1370065) associated with Wharley Hall, constructed of timber frame and nogging is separately listed reflecting value as an individual asset as well as having group value with the hall;
- South of the A45 is located the grade II listed Pasture Farmhouse (NHLE 1343225).
- 1km west of Bickenhill is the grade II listed Castle Hills Farmhouse (NHLE 1075950), built from the 17th century; and
- The grade II listed Henwood Mill (NHLE 1045849).

6.5.44. A number of non-designated built heritage assets have been identified within the 500m study area which relate to the historically rural character of the post-medieval landscape. These include:

- Heath Farm (5759);
- Home Farm (5760);
- A barn (5762) east of Bickenhill;
- Hurdle Hall farm (10510);
- A 16th/17th century timber framed cottage recorded as 'Building, Middle Bickenhill Lane'; and
- Hampton Lane Farmhouse (4172).

## 6.6. Potential Impacts

6.6.1. An assessment of the value of potentially affected assets, the type and magnitude of impacts likely to arise during the construction and operational phases of the proposed scheme, and the significance of effect(s) (prior to mitigation measures) is being undertaken, in accordance with methodology and criteria presented in the EIA Scoping Report and based on current available information.

6.6.2. The cultural heritage impact assessment is ongoing and will be reported in full in the ES, taking into account mitigation measures which are being developed. The information presented below provides a preliminary snapshot of the current status of the assessment (without mitigation), and thus the assessment findings are subject to change and confirmation.

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## Construction Impacts

### *Archaeology*

6.6.3. There would be no impacts on designated archaeological assets as a result of proposed scheme construction; however, the following non-designated archaeological assets would potentially be affected:

- The earthworks of a post-medieval farmhouse and rabbit warren (5668) have archaeological and historical significance because of the information they contain about the agricultural development and land management of the area. The site is, however, considered to be of no more than low value. The proposed scheme would affect the western side of this asset, resulting in a potential minor adverse impact.
- Gorsey Lane (10827) is a post-medieval to modern dated old road with no visible remains. Its archaeological and historic significance lies in its ability to provide information on the connections between places in this landscape. It is considered to be of no more than negligible value. Any buried remains relating to this asset, particularly along the western third of the trackway, would be physically impacted by the proposed scheme, potentially resulting in a moderate adverse impact.
- The site of an industrial pit of post-medieval to modern date lies adjacent to the current M42 (5758). It has some limited historic significance related to the information it provides regarding local industrial processes, but is of no more than negligible value. The proposed scheme would run very close to or over this asset, potentially resulting in a moderate adverse impact on any existing buried remains.
- The Medieval ridge and furrow and associated enclosure (5797) has archaeological and historical significance as it can provide information regarding the medieval agricultural process and land management of the area. Its value is considered to be no more than negligible. The proposed scheme would have a physical effect on this asset leading to a potential moderate adverse impact.
- A linear ditch of unknown date runs parallel to the M42 motorway, along with an undated enclosure in the northern corner of the field (10833). The archaeological and historic value of this asset lies in its ability to inform about movement through the landscape and land use over time. As a feature of unknown date, its value is considered to be negligible. The proposed scheme would affect the eastern side of this asset, resulting in a minor adverse impact.
- A trackway with origins in the Iron Age and used during the medieval period (1376) holds archaeological and historic significance in its ability to inform on movement across the landscape over time. It is considered to be of low value. The proposed scheme would intersect the line of this trackway in two places, leading to a potential moderate adverse impact.
- An area of medieval ridge and furrow (5804) has archaeological and historical significance as it can provide information regarding the medieval agricultural process and land management of the area. Its value is considered to be no more than negligible. The proposed scheme would have a physical effect on this asset leading to a potential minor adverse impact.



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*Built Heritage*

6.6.4. The following designated and non-designated built heritage assets, and conservation areas, would potentially be affected by construction of the proposed scheme.

- Hampton in Arden Conservation Area is located approximately 200m from the proposed scheme, and construction would result in visual intrusion to views from the west. This designated asset is of medium value. The proposed scheme construction would result in a potential minor adverse impact on the relationship between the former parkland of Hampton Manor and its rural setting.
- Bickenhill Conservation Area is located immediately east of the B4438. The proposed scheme would pass through the western edge of the conservation area, resulting in an area of the historic approach to the village from the west on St Peters Lane being removed. The proposed scheme would cut off the village from its rural setting. This designated asset is of medium value. The proposed scheme would have a potential moderate adverse impact on the ability to understand the significance of the area.
- The former parklands, which form the setting of the grade II listed Garden Terrace, Walls and Steps at Hampton Manor, are of medium value. The proposed scheme would have a potential minor adverse impact.
- The setting of Hampton Manor, a medium value asset, would be affected by increased visual intrusion into its historic setting due to the proposed scheme, resulting in a potential minor adverse impact.
- The Church of St Peter could potentially be severed from its setting by isolating the village from the wider rural area, and could experience increased visual intrusion from construction of the proposed scheme into fields to the north-west. The proposed scheme would have a potential minor adverse impact on this high value asset as it would impact on the ability to understand the significance of the asset.
- The grade II listed Grange Farmhouse would potentially experience increased noise and light from traffic associated with the proposed scheme construction phase. The proposed scheme would have a potential minor adverse impact on this high medium value asset as it would impact on the ability to understand the significance of the asset.
- The undesignated Hampton Lane Farmhouse is a low value asset and would be subjected to visual and noise impacts to its agricultural setting during proposed scheme construction, attributed to the proximity of works north and south of the farmhouse. The loss of sense of place which is derived from its setting would result in a potential moderate adverse impact on this asset.
- Non-designated assets located within the Bickenhill Conservation Area (comprising Glebe Farmhouse, The Croft, Yew Tree Farmhouse, Church Farmhouse, Barn at Church Farm, Rose Bank, Hazel Cottage, the Vicarage and Harpsford) are considered to be of low value. These assets would experience comparable impacts to those identified for the conservation area itself, and would accordingly experience potential minor adverse impacts.

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## Operational Impacts

### *Archaeology*

- 6.6.5. None of the identified archaeological assets would be affected by the operation of the proposed scheme.

### *Built Heritage*

- 6.6.6. The following designated and non-designated built heritage assets, and conservation areas, would potentially be affected by operation of the proposed scheme:

- Hampton in Arden Conservation Area would potentially experience light intrusion into the setting of the conservation area, affecting the former parklands of Hampton Manor. This would result in a potential minor adverse impact on this medium value asset.
- The potential lighting impacts on the former parkland of Hampton Manor would result in impacts upon the setting of the Garden Terrace, Walls and Steps at Hampton Manor. A potential minor adverse impact would arise on this medium value asset.
- The potential lighting impacts on the former parkland of Hampton Manor would result in impacts upon Hampton Manor, as the parkland comprises part of its historic setting. This medium value asset would experience a potential minor adverse impact.
- Bickenhill Conservation Area would be subject to increased noise from traffic and light intrusion. This medium value asset would experience a potential minor adverse impact as a result.
- Lighting impacts would arise on views towards the Church of St Peter from the north, although these would not be in key historic views. A potential minor adverse impact is predicted due to the reduction in the ability to understand the significance of this high value asset.
- Grange Farmhouse would experience a degree of erosion of its rural setting from proposed scheme traffic related light and noise, reducing its sense of place. For this medium value asset, a potential minor adverse impact is predicted.
- The undesignated Hampton Lane Farmhouse, a low value asset, would experience increased light and noise from proposed scheme traffic and from road lighting. The degree of severance from the asset's historically rural setting would represent a moderate adverse impact.
- The non-designated assets located within the Bickenhill Conservation Area (comprising Glebe Farmhouse, The Croft, Yew Tree Farmhouse, Church Farmhouse, Barn at Church Farm, Pasture Farmhouse, Rose Bank, Hazel Cottage, the Vicarage and Harpsford) would be subject to the same impacts as the Bickenhill Conservation Area. These low value assets would experience a potential minor adverse impact.

## 6.7. Design, Mitigation and Enhancement Measures

- 6.7.1. Mitigation is currently being considered as part of the design-development of the proposed scheme. This includes:

- 
- Refinement of the alignment of the proposed scheme to avoid assets, where possible.
  - Minimising overall landtake requirements to reduce the extent to which the proposed scheme could affect known and potential cultural heritage assets.
  - Considering the horizontal and vertical alignment of the proposed scheme to reduce its visual prominence.
  - The careful siting of signage and lighting to reduce visual intrusion.
  - The sympathetic use of landscaping, earthworks and barriers to reduce visual and noise effects on cultural heritage assets.
- 6.7.2. A programme of archaeological fieldwork is to be developed and undertaken as part of the mitigation strategy for the proposed scheme. This will be developed further once the results of the geophysical surveys and the archaeological monitoring of geotechnical trial pits are available, with the measures set out in the outline CEMP within the ES.
- 6.7.3. Construction activities would be undertaken by the appointed contractor in accordance with industry best practice, and in line with measures set out in their CEMP. Potential measures that could be adopted and implemented, based on the outcomes of the mitigation strategy, could include:
- The recording of built heritage and historic landscape character in advance of construction to provide a permanent documented record of the current form and condition of affected assets, and their compilation in an appropriate format.
  - Undertaking archaeological investigations in advance of, of during, the construction phase.
  - The application of a watching brief (archaeological supervision) during construction activities.
  - The installation of physical protection measures around assets.
  - The temporary removal and reinstatement of assets following construction.
- 6.7.4. The design-based measures described above would serve to reduce types of operational effect on cultural heritage, particularly those associated with the introduction of the proposed scheme (and traffic) into the setting of assets.

## **6.8. Assessment of Effects**

- 6.8.1. The preliminary assessment has concluded that, prior to the implementation of mitigation measures, the following effects could arise on cultural heritage resources:
- Construction effects of no greater than slight adverse on the seven undesignated archaeological assets.
  - Construction effects of slight and moderate adverse on the Hampton in Arden and Bickenhill Conservation Areas respectively.
  - Construction effects of between neutral and slight adverse on 15 designated and undesignated built heritage assets.
  - Operational effects of slight adverse on the Hampton in Arden and Bickenhill Conservation Areas.
  - Operation effects of between neutral and slight adverse on 15 designated and undesignated built heritage assets.

- 6.8.2. Further work will be undertaken as part of the assessment to develop, refine and agree mitigation measures for cultural heritage. Once established and agreed with relevant statutory bodies, an assessment will be made of the role such measures would have in mitigating the above effects to reduce their significance. The final assessment findings will be reported in the proposed scheme ES.

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## 7. LANDSCAPE

### 7.1. Introduction

7.1.1. This chapter presents the preliminary findings of an assessment into the potential proposed scheme landscape and visual effects.

7.1.2. For the purposes of this landscape and visual impact assessment (LVIA), a clear distinction is being drawn between landscape and visual impacts as follows:

- **Landscape Impacts:** These relate to direct impacts of the proposed scheme upon the physical characteristics or components of the landscape which form its character (e.g. landform, vegetation, and buildings) and indirect impacts arising from changed perception of the landscape or its value;
- **Visual Impacts:** These relate to the changes arising from the proposed scheme to individual 'receptors' views of the landscape or townscape (e.g. local residents or passing motorists).

7.1.3. The approach to the assessment and the methods being used to identify potentially significant landscape and visual effects are set out in the M42 Junction 6 Improvement Scheme EIA Scoping Report.

7.1.4. In summary, the process of scoping identified that the construction and/or operation of the proposed scheme could result in the following:

- Changes to the landscape as a result of the construction of the proposed scheme (proposed bypass and a grade separated junction);
- Changes to existing field patterns and landform;
- Viewpoints from static receptors in and around Bickenhill Village; and
- Viewpoints associated with Public Rights of Way (PRoW).

7.1.5. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of landscape and visual effects associated with highway-based improvements.

### 7.2. Stakeholder Engagement

7.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and records concerning landscape designations and agreeing viewpoints within the defined study areas (refer to Section 7.4), in addition to developing the assessment scope.

7.2.2. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the landscape and visual assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- Clarifying the extents of the study area; and
- including the user views from the Grand Union Canal within the assessment

7.2.3. Consultation will continue with Natural England, SMBC through the EIA process to: further refine the adopted study areas; discuss the magnitude of predicted impacts and the significance of landscape and visual effects; and agree appropriate mitigation measures.

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### **7.3. Assessment Assumptions and Limitations**

- 7.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.
- 7.3.2. The findings of the preliminary assessment may be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further research and investigative surveys are undertaken to fully understand its potential effects.

### **7.4. Study Area**

- 7.4.1. The process of scoping identified that a 1km study area corridor for landscape effects and a 500m study area of visual effects was the most appropriate study area to identify to potential receptors.
- 7.4.2. Following statutory consultation as part of the EIA Scoping Report, a request was made on behalf of the River and Canal Trust by the Planning Inspectorate to include an assessment of the public users of the Grand Union Canal. The study area will be increased to take these receptors in to consideration.
- 7.4.3. In the case of the proposed scheme, the study area of the assessment has been defined by a combination of IAN 135/10 guidance, review of the PCF Stage 2 ZTV, professional judgement, and field survey verification.

### **7.5. Baseline Conditions**

- 7.5.1. The following tasks have been undertaken to date to establish the baseline conditions that exist within the adopted study areas:
- A review of relevant legislation, planning policy and guidance concerning the protection landscape resources;
  - Desk-based review of applicable records obtained from third party sources including: SMBC, North Warwickshire policy documents, Ordnance Survey mapping; aerial photography; and other web-based information sources;
  - A review of published studies undertaken to inform route optioneering and selection at PCF Stage 2;
  - A site visit (September 2017) to undertake photographic records of the seasonal changes in the study area and to appreciate the topography of the immediate proposed scheme alignment.

#### **Landscape Designations**

- 7.5.2. There are no statutory landscape designations of National Parks or Areas of Outstanding Natural Beauty associated with the study area. There are no non-statutory landscape designations associated with the study area. The absence of a formal designation does not, however, determine that a landscape is necessarily of low value; factors such as accessibility and local scarcity can render areas of unremarkable quality highly valuable as a local resource.
- 7.5.3. Bickenhill and Hampton-in-Arden are designated as Conservation Areas (refer to Chapter 6: Cultural Heritage). These conservation areas are relatively well screened by existing woodland and vegetation from the surrounding built form.

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## Landscape Character

- 7.5.4. The landscape within the study area in the broader scale falls within Natural England's National Character<sup>18</sup> Area (NCA) 97: Arden.
- 7.5.5. Landscape character assessments undertaken by Warwickshire County Council<sup>19</sup>, SMBC<sup>20</sup> and North Warwickshire Borough Council<sup>21</sup> have been referenced during the previous appraisal stage to describe the existing landscape and develop the Local Character Areas (LCA)<sup>22</sup> within the study area.
- 7.5.6. At the regional scale the study area is part of the Arden Parkland character area of the Warwickshire Landscape Guidelines<sup>23</sup>. This regional landscape consists of an enclosed, gently rolling landscape defined by woodland edges, parkland and belts of trees. The landscape is characterised by the gently rolling countryside with medium to large scale defined woodland edges, belts of trees and wooded streamlines. The impression of enclosure is enhanced by the almost flat topography, which emphasises woodland edges. The enclosed landscape is created by ancient woodlands, hedgerow trees and belts of trees although this is not a common feature with the most significant instances found alongside transportation corridors.
- 7.5.7. The landscape character of the study area is described by the Solihull's Countryside Strategy 2010-2020 and the North Warwickshire Landscape Character Assessment.
- 7.5.8. As described during PCF Stage 2 study and verified through desk study and site visits within this assessment, relevant character areas identified within Solihull's document include: 2: The Western Fringe, 3: The Motorway Corridor, 5: The Rural Heartland. Within the North Warwickshire character assessment, relevant areas are: 8: Blythe Valley Parkland Farmland, and 10: Cole Valley.
- 7.5.9. These have informed the development of three Local Character Areas (LCA) for the purpose of this assessment and within the 1km buffer forming the study area. The identified LCAs are shown on Figure 7.1:
- LCA 1 Arden Farmland;
  - LCA 2 Blythe Valley Parkland Farmland, and
  - LCA 3 Transport Interchange, NEC and Business Park.

### *LCA 1 Arden Farmland*

- 7.5.10. This LCA is formed of the rural landscape extending from the edges of the Solihull and the Birmingham conurbation in the west towards the broader Arden landscape and Coventry in the east.
- 7.5.11. The LCA is formed of former historic parkland which has largely been replaced by agricultural production. Field patterns reflect this transition with pockets of treed grassland and smaller fields with strong mature boundaries still existing around the fringes of the village settlements and woodlands, with the more prevalent larger arable fields occupying the intervening farmland. These larger fields have been expanded which together with the gappy hedges, have meant much of their definition has been lost. The major transport corridors, including rail and highways, also heavily influence

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<sup>18</sup> National Character Area Profile: 97. Arden. [www.naturalengland.org.uk](http://www.naturalengland.org.uk)

<sup>19</sup> Warwickshire Landscape Guidelines: Arden, Warwickshire County Council, 1987

<sup>20</sup> Solihull's Countryside Strategy 2010-2020 First Review 1.0, Solihull Metropolitan Borough Council, 2010

<sup>21</sup> North Warwickshire Landscape Character Assessment, North Warwickshire Borough Council, 2010

<sup>22</sup> Natural England, (2014). An approach to Landscape Character Assessment. Natural England

<sup>23</sup> North Warwickshire Landscape Character Assessment, North Warwickshire Borough Council, 2010

the area as they cut through the landscape and create barriers within it, whilst overhead power lines interrupt the broader skyline. The major developments around the Birmingham Airport and the NEC are also prominent visual indicators of the nearby conurbation.

- 7.5.12. Land cover ranges from woodland to small settlements to transport corridors, but the landscape primarily consists of the arable farmland. Vegetative cover includes the ancient woodlands of Aspbury's Copse, Hampton Coppice and Barber's Coppice in the south and west, as well as the numerous smaller stands scattered within the study area. The mature trees concentrated within and around the small villages and lining the wider local road network create a cohesive and widespread vegetative element. The topography of the LCA broadly falls gently from approximately 130m above ordnance datum (AOD) in the west to the east towards the River Blythe at approximately 85m AOD, and is comprised of a series of local rises which contributes to the rolling landscape and forms a series of brooks.
- 7.5.13. This LCA is a settled rural landscape surrounded and dissected by major development and transport corridors. However, despite these pressures it remains functional and intact with relatively limited areas where the components of this landscape breakdown or shift towards more diverse and discordant land uses typical of urban fringe landscapes.
- 7.5.14. Overall this LCA is comprised of a good quality rural landscape which continues to resist, but remains vulnerable to, the pressures of the urban fringe and its value is moderate, susceptibility is moderate and hence sensitivity is moderate to change to the type of development proposed.

*LCA 2 Blythe Valley Parkland Farmland*

- 7.5.15. This LCA is formed around the River Blythe as it meanders northwards around the A452 towards Coleshill and the confluence of the Rivers Tame, Cole and the Blythe and the landscapes beyond, that form their associated floodplains.
- 7.5.16. The river is set within a broad, gently sloping valley with highpoints along the valley sides of approximately 100m AOD. The landfill site at Little Packington creates a distinct artificial landform in the area. Field patterns are varied and include the small irregular pastoral fields close to the river, semi-regular arable fields associated with former estates and deer parks and larger fields on the more steeply sloping valley sides to the south. Land cover includes extensive areas of parkland associated with Packington Hall where woods that contributed to the former deer parks, treed parklands and golf courses provide a strong vegetation framework within the LCA. Combined with the riparian vegetation along the River Blythe and the infilling farmland defined by low trimmed hedges and frequent hedgerow trees a diverse and cohesive rural character results.
- 7.5.17. This LCA is generally a sparsely settled landscape with only a few scattered hamlets and farmsteads, set along a broad network of connecting lanes. There is little influence from the nearby urban expanses and transport corridors within the LCA, with the exception of the southern and western extents near to the M42 and A45 corridors where extensive road layouts, lighting and electricity pylons disrupt the rural character.
- 7.5.18. Despite the proximity of this LCA to a major city and the associated infrastructure this LCA is an intimate rural landscape with strong links to the historic land uses and settlement patterns, evidenced through the estate and parkland landscapes. Overall this LCA is comprised of a good quality remnant parkland landscape with relatively



limited influences from modern day development therefore its value is high, susceptibility is moderate and hence sensitivity is high to change to the type of development proposed.

*LCA 3 Transport Interchange, NEC and Business Park*

- 7.5.19. This LCA is formed around the urban fringe transport and business areas, bounded by the A45, M42 and residential areas at Sheldon, Marston Green and Chelmsley Wood.
- 7.5.20. Birmingham Airport, National Exhibition Centre and Birmingham Business Park dominate this area as large scale urban features which continue to be expanded and developed. The railway line, airport boundary and traffic flow systems including winding access roads with frequent roundabouts restrict movement through the area and discourages pedestrian access.
- 7.5.21. Woodland, particularly around Pendigo Lake and at Bickenhill Plantations to some extent breaks up the expanse of large buildings and car parks. The layers of buildings and woodland reduce awareness of the surrounding rural and residential areas and the A45 and M42 road corridors. The well wooded, narrow strip of fields in the north of the LCA provides a buffer between some of the commercial units and the residential areas.
- 7.5.22. Overall this LCA is a developed urban fringe area and despite the presence of woodland and a narrow strip of fields, it is dominated by large scale transport and commercial features therefore its value is low, susceptibility is low and hence sensitivity is low Sensitivity to the type of development proposed.

**Visual Context**

- 7.5.23. The visual context of the study area is largely defined by the surrounding settled rural character of the landscape.
- 7.5.24. The combination of the gentle topography, broad network of lanes and strong vegetation framework results in a sense of enclosure from within the lower lying areas, or from along the local road network which is frequently lined by roadside vegetation. Views from PRoW that traverse the open fields or higher ground, however, are afforded a wider aspect due to the areas of field expansion and degraded field boundaries. From these areas the presence of the nearby airport and NEC are evident as well as other elements of the Birmingham conurbation.
- 7.5.25. Settlement within the study area includes the edges of the Birmingham conurbation to the north and west and the villages of Bickenhill, Hampton-in-Arden and Catherine De Barnes within the study area itself. In addition there are smaller hamlets and isolated properties scattered throughout the rural farmland.
- 7.5.26. A total of 23 viewpoints within the extents of the PCF Stage 2 ZTVs have been identified and agreed at PCF Stage 2 Assessment and re-issued for consultation at PCF Stage 3 scoping. These viewpoints cover a range of views across the study area from residential and commercial properties, PRoW and local roads. The viewpoints locations are shown on Figure 7.1 and are listed in the Table 7.1 together with their assigned value. Figures 7.2A to 7.2W present photomontages from each viewpoint showing the existing views.

**7.6. Potential Impacts**

- 7.6.1. A preliminary assessment of the value of affected assets, the type and magnitude of impact likely to arise during the construction and operational phases of the proposed scheme, and the significance of effect(s) (prior to mitigation measures) has been

undertaken, in accordance with methodology and criteria presented in the EIA Scoping Report as referenced herein and based on current available information.

**Construction Phase**

7.6.2. The construction works associated with the proposed development are likely to be considerably more intrusive than the operation proposed scheme and this is attributable to the following:

- Localised demolition, material stockpiles;
- Major earthworks for cutting;
- Site signage, traffic control (pedestrian, vehicular and plant), fencing, hoarding and overhead gantries;
- Construction traffic and working machinery;
- Site huts, storage units and stored materials;
- Cranes; and
- Scaffolding and partly completed structures.

7.6.3. The proposed scheme has the potential to cause significant changes to visual receptors in key locations along the construction route – refer to Table 7.1. These potential significant effects are primarily with works associated with the proposed bypass as it passes to the west and immediate north of Bickenhill. However, the construction works are likely be phased and effects would be temporary and short term.

**Table 7.1: Construction Viewpoint Effects**

Viewpoint	Construction Phase		
	Likely Sensitivity	Likely Magnitude of Impact	Likely effect based current understanding
VIEWPOINT A – A452 / Garden Centre	Low	Minor Adverse	Slight Adverse
VIEWPOINT B – NEC/Hotel Car Park	Low	Minor Adverse	Slight Adverse
VIEWPOINT C – East Way Overbridge	Low	Major Adverse	Moderate Adverse
VIEWPOINT D – Coventry Road A45 westbound	Low	Negligible	Neutral
VIEWPOINT E – National Motorcycle Museum / National Conference Centre (NMM/NCC)	Moderate	Minor Adverse	Slight Adverse
VIEWPOINT F – Old Station Road	Moderate	Negligible	Slight Adverse
VIEWPOINT G – Right of way on railway over bridge south	Moderate	Negligible	Slight Adverse

Viewpoint	Construction Phase		
	Likely Sensitivity	Likely Magnitude of Impact	Likely effect based current understanding
VIEWPOINT H – Right of way on railway over bridge north	Moderate	Negligible	Slight Adverse
VIEWPOINT I – Bickenhill North	Moderate	Major Adverse	Moderate Adverse
VIEWPOINT J – St Peters Lane	Moderate	Major Adverse	Large Adverse
VIEWPOINT K – Right of Way west of Bickenhill 1	Moderate	Major Adverse	Moderate Adverse
VIEWPOINT L – Right of Way west of Bickenhill 2	Moderate	Major Adverse	Moderate/Large Adverse
VIEWPOINT M – Right of Way near Castle Hills Farm	Moderate	Minor Adverse	Slight Adverse
VIEWPOINT N – Right of Way at Hazel Farm	Moderate	No Change	neutral
VIEWPOINT O – Right of Way West of M42 Crossing	Moderate	No Change	neutral
VIEWPOINT P – Right of Way East of M42 Crossing	Moderate	No Change	neutral
VIEWPOINT Q – Gaelic Football Grounds	Moderate	Major Adverse	Large Adverse
VIEWPOINT R – B4438 Catherine De Barnes Lane	Moderate	Major Adverse	Large Adverse
VIEWPOINT S – Shadowbrook Lane	Moderate	Moderate Adverse	Moderate Adverse
VIEWPOINT T – Rights of Way south of Shadowbrook Lane	Moderate	Major Adverse	Large Adverse
VIEWPOINT U – Friday Lane	Moderate	Minor Adverse	Slight Adverse
VIEWPOINT V – Solihull Road (B4102)	Moderate	Minor Adverse	Slight Adverse
VIEWPOINT W – Eastcote Lane	Moderate	Negligible	Slight Adverse

## Operation Phase

### *Landscape Character*

7.6.4. Potential changes to landscape character associated with the proposed scheme operation would be contained within LCA 1 and would arise from:

- New sections of offline link road between the M42 corridor and the Clock Interchange on the A45;
- New grade separated junction on the M42 corridor;
- Alterations and additions to the existing local road network; and
- Alterations to the existing field patterns and surrounding vegetation framework and modifications to existing landform.

7.6.5. These works have the potential to change the perception of LCA 1 through the introduction of additional and new traffic movements and associated highways infrastructure within the rural landscape, leading to the fragmentation and further urbanisation of this susceptible landscape.

7.6.6. There would be no physical alterations to LCA 2, however, potential remains for changes to the perception of the landscape in some areas due to the increased visual presence of the surrounding motorway network.

7.6.7. There would be limited direct physical effects to the components of LCA 3 as a result of the proposed scheme, and any visual connections of the works are likely to be limited by woodland and building pattern.

*Visual Effects*

7.6.8. Table 7.2 provides a summary of a preliminary assessment of operational phase viewpoint effects as based upon available information. Appendix 7 contains the full visual effects table. The winter assessment has been derived from the PCF Stage 2 LVIA and will be further verified in the ongoing assessment.

7.6.9. Year 15 effects have been derived from the PCF Stage 2 assessment, and this preliminary assessment as based on design principles/assumptions currently being developed following site visits and through the design-development process.

**Table 7.2: Operational Viewpoint Effects**

Viewpoint	Likely Sensitivity	Year 1		Year 15	
		Likely Magnitude of Impact	Likely Effect	Likely Magnitude of Impact	Likely Effect
VIEWPOINT A – A452 / Garden Centre	Low	Negligible	Neutral	No Change	Neutral
VIEWPOINT B – NEC/Hotel Car Park	Low	Minor Adverse	Slight Adverse	No Change	Neutral
VIEWPOINT C – East Way Overbridge	Low	Minor Adverse	Slight Adverse	Negligible	Slight Adverse
VIEWPOINT D – Coventry Road A45 westbound	Low	Negligible	Neutral	No Change	Neutral

Viewpoint	Year 1			Year 15	
	Likely Sensitivity	Likely Magnitude of Impact	Likely Effect	Likely Magnitude of Impact	Likely Effect
VIEWPOINT E – National Motorcycle Museum / National Conference Centre (NMM/NCC)	Moderate	Minor Adverse	Slight Adverse	Minor Adverse	Slight Adverse
VIEWPOINT F – Old Station Road	Moderate	Negligible	Neutral	No Change	Neutral
VIEWPOINT G – Right of way on railway over bridge south	Moderate	Negligible	Neutral	No Change	Neutral
VIEWPOINT H – Right of way on railway over bridge north	Moderate	No Change	Neutral	No Change	Neutral
VIEWPOINT I – Bickenhill North	Moderate	Moderate Adverse	Moderate Adverse	Minor Adverse	Slight Adverse
VIEWPOINT J – St Peters Lane	Moderate	Major Adverse	Large Adverse	Moderate Adverse	Moderate Adverse
VIEWPOINT K – Right of Way west of Bickenhill 1	Moderate	Moderate Adverse	Moderate Adverse	Minor Adverse	Slight Adverse
VIEWPOINT L – Right of Way west of Bickenhill 2	Moderate	Major Adverse	Moderate/ Large Adverse	Moderate Adverse	Moderate Adverse
VIEWPOINT M – Right of Way near Castle Hills Farm	Moderate	Minor Adverse	Slight Adverse	Minor Adverse	Slight Adverse
VIEWPOINT N – Right of Way at Hazel Farm	Moderate	No Change	Neutral	No Change	Neutral
VIEWPOINT O – Right of Way West of M42	Moderate	No Change	Neutral	No Change	Neutral

Viewpoint	Likely Sensitivity	Year 1		Year 15	
		Likely Magnitude of Impact	Likely Effect	Likely Magnitude of Impact	Likely Effect
Crossing					
VIEWPOINT P – Right of Way East of M42 Crossing	Moderate	No Change	Neutral	No Change	Neutral
VIEWPOINT Q – Gaelic Football Grounds	Moderate	Major Adverse	Moderate/ Large Adverse	Major Adverse	Moderate/ Large Adverse
VIEWPOINT R – B4438 Catherine De Barnes Lane	Moderate	Major Adverse	Moderate/ Large Adverse	Major Adverse	Moderate/ Large Adverse
VIEWPOINT S – Shadowbrook Lane	Moderate	Moderate Adverse	Moderate Adverse	Minor Adverse	Slight Adverse
VIEWPOINT T – Rights of Way south of Shadowbrook Lane	Moderate	Major Adverse	Moderate/ Large Adverse	Moderate Adverse	Moderate Adverse
VIEWPOINT U – Friday Lane	Moderate	Minor Adverse	Slight Adverse	Negligible	Neutral
VIEWPOINT V – Solihull Road (B4102)	Moderate	Minor Adverse	Slight Adverse	Negligible	Neutral
VIEWPOINT W – Eastcote Lane	Moderate	Negligible	Neutral/ Slight Adverse	Negligible	Slight Adverse

## 7.7. Design, Mitigation and Enhancement Measures

- 7.7.1. Environmental considerations will be taken into account during further development of the proposed scheme design, including consideration of minimising building disturbance and land take.
- 7.7.2. An appropriate landscape design will be produced which will incorporate tree and shrub planting requirements of the proposed scheme with particular emphasis on the future development of the landscape design and the requirements of any ecological mitigation requirements and heritage features as well as the opinions of applicable local resident groups.

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- 7.7.3. The planting design of the replacement and additional trees and shrubs and their integration with the existing landscape will be carried out in accordance with the best practice guidance included in DMRB Volume 10.
- 7.7.4. Any proposed new tree and shrub planting required as part of the mitigation strategy for the proposed scheme, would aim to filter views from adjacent sensitive visual receptors whilst taking into consideration the safety constraints of Birmingham Airport. The replanting would also aim to integrate the proposed scheme within the existing landscape features, so as to not create a visual disturbance within the area, including when viewed from upper storeys of buildings.
- 7.7.5. A minimum three year landscape management plan would be prepared and implemented to ensure the establishment and management of the planting to ensure that it fully achieves its intended function of screening and integration.
- 7.7.6. Proposed planting on the remodelled and new embankments and cuttings will be designed to reinforce the existing vegetation and to complement the species composition found locally, using native plant species.
- 7.7.7. Careful design and siting of new lighting and signage will aim to minimise visual intrusion and light spill into the surrounding area and will be assessed within the associated proposed scheme assessment.

#### **Construction Phase**

- 7.7.8. Construction activities would be undertaken by the appointed contractor in accordance with industry best practice, and in line with measures set out in their CEMP. Potential measures that could be adopted and implemented, based on the outcomes of the mitigation strategy, could include: limiting construction lighting and signage to that which is absolutely necessary to reduce additional visual clutter and minimise effects on both landscape character and visual amenity.

#### **Operation Phase**

- 7.7.9. Other than the ongoing maintenance of the implemented landscape design, no further operational phase mitigation measures are proposed.

### **7.8. Assessment of Effects**

- 7.8.1. A scheme of this nature has the potential to affect a number of receptors associated within the landscape of visual envelope during both construction and operation, namely:
- **Residential:** Local residents close to the proposed scheme;
  - **Recreational:** NMUs of the trunk road and local road network, cycle ways, footpaths and recreational grounds; and
  - **Employees:** workers and users of the surrounding industrial areas.
- 7.8.2. The new sections of the proposed link road would extend the physical extent of the M42 and A45 corridors and lead to new or increased sense of scale associated with the surrounding network and associated traffic.
- 7.8.3. In addition, works along the existing M42 corridor at existing junction would likely increase existing awareness of the M42 corridor where it already exerts an influence within the surrounding area, as a result visual effects are likely to occur to:

- Viewpoints associated with surrounding static visual receptors of variable sensitivity, some of which have existing views of both the M42 and A45 corridors and some that currently have limited or no awareness. These receptors would be subject to changes as a result of new roads, junctions or flyovers, slip roads and additional lighting some of which would be substantial; and
- Viewpoints associated with mobile users of local roads and PRow which may have increased views or awareness of the surrounding highways infrastructure or would experience new views. These receptors would be subject to variable changes to their view as a result of changes to the existing layout.

7.8.4. The preliminary assessment has concluded that, prior to the implementation of mitigation measures, there is the potential for significant landscape and visual effects – such effects could arise from:

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

7.8.5. Further work will be undertaken as part of the assessment to develop, refine and agree mitigation measures for landscape and visual aspects. Once established and agreed with relevant statutory bodies, an assessment will be made of the role such measures would have in mitigating the above effects to reduce their potential significance.



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## 8. BIODIVERSITY

### 8.1. Introduction

8.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on biodiversity. Biodiversity is the term used to describe all plant and animal life in a particular area (habitat).

8.1.2. The approach to the assessment and the methods being used to identify potentially significant effects on biodiversity are set out in the M42 Junction 6 Improvements EIA Scoping Report. In summary, the process of scoping identified that the construction and/ or operation of the proposed scheme could result in effects on the following features:

- The loss, fragmentation and/ or severance of established wildlife habitats through the process of land take (which has the potential to affect species);
- The killing, injuring and/or disturbance of species from construction and operational activities;
- Effects on statutory and non-statutory designated sites of ecological importance; and
- Indirect effects on habitats and species from noise, watercourse pollution and/or sedimentation, dust, lighting, human disturbance and the introduction of invasive species.

8.1.3. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of effects on biodiversity associated with highway-based improvements. It is supported by a series of technical appendices in PEI Report Volume III (see Appendix 8A to 8H) which present:

- An extended Phase 1 habitat survey (Appendix 8A);
- A bat scoping assessment (Appendix 8B);
- A water vole survey (Appendix 8C);
- A great crested newt survey (Appendix 8D);
- A reptiles survey (Appendix 8E);
- A white-clawed scoping assessment (Appendix 8F);
- A woodland National Vegetation Classification (NVC) survey (Appendix 8G); and
- A grassland NVC survey (Appendix 8H).

8.1.4. Other surveys that ongoing, but have yet to be completed are for: badger; bats; common dormouse; breeding and wintering birds; great crested newts (where access was unavailable in 2017 or where previous results were inconclusive); terrestrial invertebrates; hedgerows.

8.1.5. The results of all completed ecological surveys will be presented in the ES and will be used to inform the biodiversity impact assessment.

### 8.2. Stakeholder Engagement

8.2.1. Natural England has been engaged as part of the scoping process to identify and agree the scope of bat surveys.

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- 8.2.2. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the biodiversity assessment has been reviewed to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:
- an operational assessment of barn owls;
  - an assessment of air quality effects on non-designated habitats is included within the ES; and
  - further clarification and appropriate assessment on water voles, reptiles and white-clawed crayfish.
- 8.2.3. In addition, the mitigation options for the proposed scheme will take into account advice from the Environment Agency with respect to the River Blythe SSSI, and have regard to any other sensitive watercourses potentially affected.
- 8.2.4. Consultation will continue with Natural England and other relevant consultees to: agree survey requirements, survey findings, the magnitude of predicted impacts and the significance of effects on biodiversity, and agree appropriate mitigation measures.

### **8.3. Assessment Assumptions and Limitations**

- 8.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.
- 8.3.2. Due to the absence of full ecological survey data and the final proposed scheme design, the assessment has assumed that all habitats within the proposed scheme footprint would likely be lost as a consequence of its construction.
- 8.3.3. The nature conservation value assigned to ecological features potentially affected by the proposed scheme reflects their known or potential status and distribution within the defined study area (as described below). Where data and information are unavailable or incomplete, a worst case assumption has been made of their potential value.
- 8.3.4. The potential effects on biodiversity due to the proposed scheme have been assessed in the absence of defined mitigation measures (i.e. those measures over and above those that which would reasonably be expected to be implemented, based on knowledge of good or established practice for similar highways schemes, or as otherwise necessary to comply with legislation). As such, the findings of this preliminary assessment may be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further surveys are undertaken to fully understand its potential effects and associated mitigation requirements.

### **8.4. Study Area**

- 8.4.1. The process of scoping identified that zones of influence would need to be defined to inform data collection, based on the distance over which relevant ecological features could experience potential significant effects due to the proposed scheme.
- 8.4.2. Scoping also acknowledged that zones of influence can vary over time depending on the nature of particular activities and the sensitivity of ecological resources and receptors. For example, the area over which construction effects could potentially occur might be greater than the area associated with operational effects.
- 8.4.3. Accordingly, the following study areas were identified to progress the desk-based and site-based surveys, the extents of which were informed by published guidance and

professional judgement, and with reference to the geographic location, nature and scale of the proposed scheme:

- International statutory nature conservation designations: 10km (and 30km for bats);
- National statutory nature conservation designations: 2km;
- Local statutory nature conservation designations: 1km;
- Non-statutory nature conservation designations: 2km;
- Protected and notable habitats and species: 1km;
- Ponds: 250m;
- Controlled weed species: 1km;
- Protected and notable habitats and species<sup>24</sup>: 1km.

8.4.4. The study areas applied to the field surveys are summarised below and can be found within Appendix 8A-8H:

- Phase 1 Habitat Survey: Within and adjacent to the proposed scheme.
- Bats: 1 km from proposed route alignment.
- Water Vole: 1 km from proposed route. Field surveys focussed on three watercourses present within the footprint of the scheme: Hollywell Brook, which passes beneath the M42 at OS grid reference SP198836, Shadow Brook, which passes beneath the M42 at SP192809 and an unnamed watercourse, which passes beneath the motorway at SP194821.
- White-clawed crayfish: 1 km from proposed route. Field surveys focussed on three watercourses present within the footprint of the scheme: Hollywell Brook, which passes beneath the M42 at OS grid reference SP198836, Shadow Brook, which passes beneath the M42 at SP192809 and an unnamed watercourse, which passes beneath the motorway at SP194821.
- Great Crested Newts: Water bodies within 500m of proposed route alignment
- Reptiles: Three areas of suitable reptile habitat within and/or adjacent to the proposed route alignment. These include two fields to the west of Catherine de Barnes Lane (central grid references SP182818 and SP183813) and the southern embankment of the Clock Interchange and adjacent field margin (central grid reference: SP186828).
- Terrestrial Invertebrates: Aspbury's Copse Ancient Woodland/ potential Local Wildlife Site/ Ecosite and Castle Hill Farm Meadows LWS.
- Woodland NVC: Aspbury's Coppice Ancient Woodland/ potential Local Wildlife Site/ Ecosite.
- Grassland NVC: Semi-improved neutral grassland fields and a large improved grassland field south of the western unit of Bickenhill Meadows SSSI.

## 8.5. Baseline Conditions

8.5.1. The following tasks have been undertaken to date to establish the nature conservation designations and protected and notable habitats and species (ecological features) that exist within the adopted study areas:

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<sup>24</sup> Relevant protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended); Schedules 2 and 5 of the Habitats Regulations; species and habitats of principal importance for nature conservation in England listed under section 41 (s41) of the Natural Environment and Rural Communities Act 2006 (as amended); and other species that are Nationally Rare, Nationally Scarce or listed in national or local Red Data Lists and Biodiversity Action Plans.

- A review of relevant legislation, planning policy and guidance concerning nature conservation and enhancement;
- Desk-based review of ecological records, species lists and biodiversity action plans from information sources including: the Multi-Agency Geographic Information for the Countryside (MAGIC) website; Natural England; and Warwickshire Biological Record Centre;
- A review of records pertaining to non-native controlled weed species;
- A review of Ordnance Survey mapping and aerial photography; and
- A review of published studies undertaken to inform route optioneering and selection at PCF Stage 2, studies into the HS2 project<sup>25</sup> where assessment study areas coincide with those adopted for the proposed scheme, and ecological survey reports derived from studies undertaken on the proposed M42 Motorway Service Area (MSA) project<sup>26 27 28</sup>.

### Nature Conservation Designations

8.5.2. The desk-based review has confirmed that:

- There are no international statutory nature conservation designations for bats within 30km of the proposed scheme;
- There are no other statutory international nature conservation designations within 10km of the proposed scheme; and
- There are no local statutory nature conservation designations within 1km of the proposed scheme.

8.5.3. National statutory nature conservation sites identified within 2km of the proposed scheme are summarised in Table 8.1 and depicted on Figure 8.1.

**Table 8.1 Statutory National Nature Conservation Designations within 2km of the proposed scheme**

Designation	Reason(s) for Designation	Value (Reasoning)	Relationship to the Proposed Scheme
Bickenhill Meadows Site of Special Scientific Interest (SSSI)/ Warwickshire Wildlife Trust (WWT) Nature Reserve/ Ecosite (37/18)	7.2ha of lowland neutral grassland (MG4/ MG5) – one of the richest grassland floras in the county.	National (a designated SSSI)	Two separate management units both located adjacent to proposed scheme.
River Blythe SSSI	39km stretch of lowland river on clay substrate.	National (a designated	Proposed scheme would cross the SSSI south of

<sup>25</sup> <https://www.gov.uk/government/publications/hs2-phase-one-environmental-statement-volume-5-ecology/hs2-phase-one-environmental-statement-volume-5-ecology> High Speed 2 (HS2) Limited (2013)

<sup>26</sup> Wardell Armstrong (2015) Motorway Service Area (MSA) and New Junction between Junctions 5 & 6 of the M42, Solihull Invertebrate Surveys

<sup>27</sup> Wardell Armstrong (2015) Motorway Service Area (MSA) and New Junction between Junctions 5 & 6 of the M42, Solihull Fungi Survey Report

<sup>28</sup> Wardell Armstrong (2015) Motorway Service Area (MSA) and New Junction between Junctions 5 & 6 of the M42, Solihull Lichen Survey

Designation	Reason(s) for Designation	Value (Reasoning)	Relationship to the Proposed Scheme
	Botanically, one of the richest rivers in lowland England. The habitats present are also important for invertebrate communities.	SSSI)	Filey Lane. Hydrological connectivity with proposed scheme via Holywell Brook.
Coleshill and Bannerly Pools SSSI	37.7ha designated for lowland fen, marsh and swamp and for lowland broadleaved, mixed and yew woodland. The two pools and land between form the only valley mire system in Warwickshire.	National (a designated SSSI)	Location is adjacent to proposed scheme.

8.5.4. Non-statutory nature conservation designations identified within 1km of the proposed scheme are summarised in Table 8.2 and depicted on Figure 8.2. All ungraded, destroyed and rejected sites have been excluded from the table. Statements have been included in the table where certain sites have been scoped out of the assessment due to the process of scoping identifying limited potential for effects to occur as a result of the proposed scheme.

#### Habitats

8.5.5. Habitats identified as being present within the adopted study area are summarised in Table 8.3 and depicted on Figure 8.3, the full details of which are presented in Appendix 8A. Statements have been included in the table where certain habitats have been scoped out of the assessment due to the process of scoping identifying limited potential for effects to occur as a result of the proposed scheme.

**Table 8.2 Non-Statutory Nature Conservation Designations within 1km of the proposed scheme**

Designation (Reference Number)	Reason(s) for Designation	Value (Reasoning)	Relationship to the Proposed Scheme
Aspbury's Coppice Ancient Woodland potential LWS (pLWS) (P1)/Ecosite (49/18)	Ancient woodland site where replanting has replaced the previous tree cover	County (The pLWS meets a number of criteria for which a LWS would be designated due to the presence of ancient woodland, ancient woodland indicator species and notable lichen, fungi and invertebrate species. Ancient woodland is also a habitat of principal importance (HPI))	Proposed scheme would be located within the LWS
Holywell Brook corridor to A41 pLWS (P13) / Ecosite (76/28)	Aquatic habitats and associated grassland, woodland and online ponds	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Crossed by proposed scheme
Castle Hill Farm Meadows LWS (L2) / Clock Lane Meadows Ecosite (53/18)	The LWS is one of the largest and most important grasslands in the county	Regional (Species-rich grasslands of this type and quality are now rare with less than 1% of the NCA occupied by high quality lowland meadow habitat, local status is typical of status of the habitat nationally)	Proposed scheme would be located within the LWS and approximately 300m east of the Ecosite
Barber's Coppice Ecosite (05/18)	Mixed woodland.	Borough (Ecosite information from WBRC)	Located approximately 40m south of proposed scheme
Main Birmingham to London Railway Line Ecosite (21/18)	Marginal habitat of some value as a refuge and distribution corridor for nesting birds and other local species	Local (Parish) (Ecosite information from WBRC)	Adjacent to proposed scheme
Hen Wood and Hen Wood Meadow LWS (L20)	Damp meadow adjacent to River Blythe SSSI that supports a variety of grasses and herbs	County (LWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located adjacent to the southern extent of proposed scheme, and approximately 640m south of the proposed works to the M42
Disused Railway &	A disused railway with overgrown	County (pLWS designated by a Local	Located adjacent to the eastern extent of proposed

Designation (Reference Number)	Reason(s) for Designation	Value (Reasoning)	Relationship to the Proposed Scheme
Sidings pLWS (P8) / disused Track and Siding Wood Ecosite (25/28B)	neglected hedgerows of oak ( <i>Quercus</i> sp), ash ( <i>Fraxinus excelsior</i> ) and hawthorn ( <i>Crataegus Monogyna</i> )	Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	scheme, and approximately 370m east of proposed works to M42 Junction 6
Coleshill Pool Wood LWS (07/18)	Oak woodland with frequent birch ( <i>Betula</i> sp.)	County (LWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located adjacent to the northern extent of proposed scheme, and approximately 1.3km north of the proposed works to the M42
Catherine De Barnes Meadows Ecosite (36/18)	Although some of the initial seven species-rich fields and a small area of woodland have now been destroyed, the remainder of the site is still present	County (Ecosite designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located adjacent to the south western extent of proposed scheme, and approximately 420m to the west of the proposed works to Solihull Road
Greens Ward Piece LWS (L7) (part of Shadowbrook Lane Meadows Warwickshire Wildlife Trust (WWT) Nature Reserve) / Ecosite (37/18)	Small field of unimproved pasture	County (LWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located off Shadowbrook Lane, approximately 20m to the north of proposed scheme
Wayside Cottages Meadow LWS (55/18)	A field of largely unimproved herb rich grassland	County (LWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 430m east of proposed scheme.
Pendigo Lake & The Rough Ecosite (33/18)	Not available	Up to County (Ecosite designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 300m west of proposed works to the M42
Marsh adjacent to River Blythe pLWS (P16)	Marsh area next to the River Blythe	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 140m east of proposed scheme, and approximately 460m south of the proposed works to the M42

Designation (Reference Number)	Reason(s) for Designation	Value (Reasoning)	Relationship to the Proposed Scheme
Bickenhill Churchyard Ecosite (41/18)	Little ecological information available, likely to be semi-improved or unimproved grassland Available information does not indicate presence of notable habitats or species	Local (Parish) (Ecosite information from WBRC)	Located approximately 130m east of proposed scheme. Given its relative value, this site has been scoped out of the assessment
Henwood Mill LWS (L10)	Wet woodland mostly dominated by alder ( <i>Alnus glutinosa</i> )	County (LWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 130m north west of proposed scheme
Land by Henwood Tip pLWS (P15)	Wet alder coppice with crack willow and an understory of scattered elder	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 160m north west of proposed scheme
Pond at Hampton Manor Wood North pLWS (P20) / Hampton Manor Grounds & Churchyard & Hampton-in-Arden Spinney Ecosite (70/28)	Broadleaved plantation with diverse range of species and relatively species rich grassland area	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 180 m east of proposed scheme
Grand Union Canal pLWS (P11)	The banks and canal support a varied flora. Site of County value according to the citation	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 200m south of proposed scheme Unlikely to be affected due to distance from preferred route alignment, therefore, scoped out of further assessment
Denbigh Spinney LWS (L4)	Broadleaved semi-natural woodland with abundant alder	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 260m north east of proposed scheme
Henwood Tip LWS (L11)	Poor wet semi-improved grassland with undulating hollows and ridges	County (LWS designated by a Local Wildlife Sites Partnership for	Located approximately 355m north west of proposed scheme Due to its distance from the proposed scheme, this site



Designation (Reference Number)	Reason(s) for Designation	Value (Reasoning)	Relationship to the Proposed Scheme
		Warwickshire, Coventry and Solihull)	has been scoped out of the assessment
Terrets and Pool pLWS (P27)	Alder woodland	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 500m north west of proposed scheme Due to its distance from the proposed scheme, this site has been scoped out of the assessment
Bickenhill Plantation LWS (L1)	Coniferous plantation and birch woodland	County (LWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 550m west of proposed scheme
GCN Pond deferred LWS (D2) pLWS	Open and poorly vegetated, no records to confirm GCN	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 730m north west of proposed scheme. Due to its distance from proposed scheme, GCN within this breeding pond are unlikely to be affected by the proposed scheme and therefore this has been scoped out of the assessment
Pumells Brook Woodland (L14)	Sycamore Acer pseudoplatanus and alder woodlands	County (LWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 800m south of proposed scheme Due to its distance from the proposed scheme, this site has been scoped out of the assessment.
Brick Kiln Hole Wood pLWS (P4)	Two areas of woodland	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 830m north west of proposed scheme Due to its distance from proposed scheme, this site has been scoped out of the assessment
Hedgerow pLWS (P12)	Hedgerow	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 880m south east of proposed scheme Due to its distance from proposed scheme, this site has been scoped out of the assessment
Purnell Brook Meadows	Semi-improved grassland	County (pLWS designated by a Local	Located approximately 880m south of proposed

Designation (Reference Number)	Reason(s) for Designation	Value (Reasoning)	Relationship to the Proposed Scheme
pLWS (P23)		Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	scheme Due to its distance from proposed scheme, this site has been scoped out of the assessment
Blythe Flood Plain pLWS (P3)	Marshy areas, semi-improved grassland and broadleaved woodland	County (pLWS designated by a Local Wildlife Sites Partnership for Warwickshire, Coventry and Solihull)	Located approximately 950m east of proposed scheme. Due to its distance from proposed scheme, this site has been scoped out of the assessment

**Table 8.3: Habitats Present within the Study Area**

Designation	Value	Reasoning	Relationship to the Proposed Scheme
Broadleaved semi-natural and mixed semi-natural woodland	Up to County	There are two areas of broadleaved semi-natural woodland within the proposed scheme (one south of the A45 and one east of Catherine De Barnes Lane), excluding local nature conservation designations which have been assessed separately in the preceding section. Only 3.12% of Warwickshire is covered by broadleaved semi-natural woodland. Given this limited cover it is considered to be of critical importance for nature conservation (Habitat Biodiversity Audit (HBA) for Warwickshire). The Phase 1 Habitat survey states the woodlands are of more recent origin than ancient woodland and does not mention any features meeting the criteria for designating woodland as a LWS. However survey was completed in February when many species are not evident and the woodland is therefore assigned up to County value pending further survey.	Two areas of broadleaved semi-natural woodland are within proposed scheme footprint
Plantation woodland	Local	Several small areas present across the study area. From the limited information in the Extended Phase 1 Habitat survey the woodlands are not HPIs but may be LBAP habitats and are therefore assigned Local value.	Closest location lies adjacent to proposed scheme. This habitat has been scoped out of the assessment as it is beyond the extents of proposed scheme
Scattered and dense/continuous scrub	Local	Small areas present across the study area. Common habitat found within the surrounding area.	Within proposed scheme footprint
Hedgerow	Up to County	Present across the study area. The Phase 1 habitat survey was completed in February when the hedgerows had been recently flailed and many species were not evident. Hedgerows will be valued when results of specific hedgerow surveys are available. Hedgerows are a HPI and LBAP habitat. In the absence of survey results, in a precautionary approach, it is assumed important hedgerows may be present and the hedgerow network is assessed as of up to County value	18 hedgerows lie within proposed scheme footprint

Designation	Value	Reasoning	Relationship to the Proposed Scheme
Arable	Local	Present across the study area. Dominant habitat found within the surrounding area both to the east and west of the existing M42. The Phase 1 habitat survey does not list species present however arable field margins, if present, are of conservation value provide food for invertebrates and farmland birds. This habitat is assigned Local value pending further survey.	Within proposed scheme footprint
Improved grassland	Site	A common habitat present across the study area and within the wider landscape. Improved grassland is species-poor and of little intrinsic conservation value and is considered to be of site value	Within proposed scheme footprint
Amenity grassland	Negligible	Common habitat found within the surrounding area and typically subject to intensive management that limits its ecological potential.	Within proposed scheme footprint
Semi-improved neutral grassland	Local	Small areas across the site excluding SSSI, LWSs and Ecosites. The NVC survey (see Appendix 8H) states the grassland is species poor semi-improved neutral grassland of low conservation value.	Two areas of semi-improved neutral grassland are within proposed scheme footprint
Marshy grassland	Up to Borough	Large area of marshy grassland in south of study area. There is little information in the Phase 1 Habitat survey report therefore cautiously assessed as up to Borough value.	Closest location is approximately 110m south east of proposed scheme. This habitat has been scoped out of the assessment as it is beyond the extents of proposed scheme
Standing water	Up to Borough	There are 35 ponds within 500m of the preferred route alignment. Only 1% of Warwickshire is wetlands including standing water and rivers (HBA) therefore this habitat is important. The GCN habitat suitability assessment (the only information available) reported approximately half of the ponds surveyed were average/ good/ excellent however 16 ponds were not surveyed due to access restrictions therefore standing water is cautiously assessed as up to Borough value.	Two ponds are within proposed scheme footprint. As both ponds were surveyed as being dry in 2017, these habitats have been scoped out of the assessment.
Running Water	Up to Borough	Holywell Brook, the River Blythe and Grand Union Canal are assessed	Within proposed scheme

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Designation	Value	Reasoning	Relationship to the Proposed Scheme
		separately in the preceding section. Aquatic invertebrate surveys for HS2 (HS2, 2013) found Shadow Brook was of moderate overall quality using the biological and environmental data collected.	footprint

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### Protected and Notable Species

- 8.5.6. Protected and notable species identified as present, or considered to have the potential to be present, during field surveys conducted in 2017 are: bats; common dormouse; badger; otter; hedgehog; birds; great crested newt; terrestrial and aquatic invertebrates and fish.
- 8.5.7. Field surveys undertaken to date have identified no evidence of water vole, reptiles or white-clawed crayfish within the adopted study areas. However, these species will be considered further in the ES.
- 8.5.8. The following sections summarise the survey outcomes, the full details of which are presented in Appendices 8B - 8F (PEI Report Volume III) (where available).

#### *Bats*

- 8.5.9. The desk study has identified that a range of bat species roost records exist within the study area. Trees, woodlands and structures with features suitable for roosting bats have been identified as part of the field surveys, with many mature trees having features of potential suitability for roosting bats. Notwithstanding this, no bat roosts have been confirmed to date during the surveys.
- 8.5.10. Woodlands, grassland, arable fields, water bodies and hedgerows are suitable for foraging and commuting bats. Surveys to date have recorded the presence of a range of common and rarer bat species in the study area.
- 8.5.11. As survey work is ongoing, it is not yet possible to accurately determine the relative importance of the study area for bats or the nature conservation value of the bat populations present. Accordingly, by adopting a precautionary approach the bat assemblage is assessed as being of up to County nature conservation value. This value rating will, however, be confirmed following completion of the surveys and reported in the ES.

#### *Common Dormouse*

- 8.5.12. No records for dormouse were obtained as part of the desk study. In order to establish potential dormouse presence, surveys are currently being undertaken within the study area, the findings of which will be considered as part of the ongoing assessment and reported in the ES. The preliminary findings of these surveys have, however, identified localised areas of woodland, scrub and hedgerow which comprise habitats that are not optimally located or managed for dormouse.

#### *Badger*

- 8.5.13. The desk study [REDACTED] This has been confirmed as part of the Phase 1 habitat survey undertaken for the proposed scheme (refer to Appendix 8A), which identified woodland, scrub, grassland and arable fields as providing sett-building and foraging habitat.
- 8.5.14. Due to the confidential nature of badger sett information, all current survey and assessment data has been withheld from this PEI Report. This information is, however, being fully considered and evaluated as part of the ongoing assessment into the potential effects on this legally protected species. The badger population associated with the study area is currently assessed as being of Local nature conservation value.

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*Otter*

- 8.5.15. The desk study confirmed records of otter presence on Holywell Brook, River Blythe and the Grand Union Canal, with the majority of records relating to the River Blythe. The closest otter records to the proposed scheme are: Holywell Brook (approximately 730m east (downstream)); and the Grand Union Canal (approximately 220m north of where the canal crosses the River Blythe and approximately 720m west (upstream)).
- 8.5.16. Otters typically have home ranges in the order of 11km to 18km of a main river and its associated tributaries. Given these typical territory sizes, it is considered that the study area would be very unlikely to sustain more than one or two breeding pairs of otter. Accordingly, the otter population is considered to be of up to Borough nature conservation value.

*Birds*

- 8.5.17. The desk study returned records of four Schedule 1 species within 1km of the proposed scheme in the last 10 years, namely: barn owl, fieldfare, redwing and wryneck.
- 8.5.18. As field surveys are ongoing, it is not yet possible to assess the relative importance of the study area for breeding and wintering birds, or determine the relative nature conservation value of the individual species populations present.
- 8.5.19. Based on available information gathered to date, the breeding and wintering bird assemblages associated with the study area have been assessed as being of up to Borough nature conservation value; however, the final survey outcomes will confirm this as part of the assessment process.

*Great Crested Newt*

- 8.5.20. The following ponds have been identified within the study area (within 500m of the proposed scheme) (refer to Appendix 8D for pond locations):
- Two ponds (10 and 39) are located within the proposed scheme footprint;
  - 15 ponds (1, 3, 4, 5, 8, 45, 40, 41, 43, 34, 42, 20, 21, 19, and 18) are located within 250m of the proposed scheme, and therefore are within likely movement distances of the species from its ponds in the absence of barriers;
  - 18 ponds (2, 47, 6, 7, 11, 12, 9, 38, 46, 44, 35, 36, 17, 22, 23, 24, 25 and 26) are located within 500m of the proposed scheme, and therefore are within potential maximum movement distances of the species from its ponds in the absence of barriers.
- 8.5.21. Ponds 10 and 39 were dry and not surveyed in 2017. 16 ponds have been unable to be surveyed in 2017 due to land access restrictions; these will be surveyed and assessed in 2018.
- 8.5.22. Small populations of great crested newts were recorded in five of the ponds within 500m of the proposed scheme during field surveys in 2017 (see Figure 8.4), specifically:
- Ponds 6, 7, 11 and 12: located between approximately 260m and 410m east of the proposed scheme; and
  - Pond 36: located approximately 330m east of the proposed scheme.

8.5.23. Based on the survey outcomes to date, the study area is considered to have potential to support a metapopulation of great crested newts of up County nature conservation value.

*Terrestrial Invertebrates*

8.5.24. Data collected from the desk study and the Phase 1 habitat survey (refer to Appendix 8A) indicate that unimproved grassland, woodland and marshy grassland west of the M42 are likely to support locally important terrestrial invertebrate assemblages.

8.5.25. Based on current available information, the terrestrial invertebrate assemblage is assessed as being of up to Borough nature conservation value. Invertebrate surveys are currently being undertaken and the results of which will be evaluated as part of the ongoing assessment to confirm this value rating.

*Aquatic Invertebrates*

8.5.26. Aquatic invertebrate surveys undertaken as part of the HS2 project in 2013 (HS2, 2013) examined Holywell Brook and Shadow Brook, which fall within the adopted study area for the proposed scheme. These surveys recorded the following:

- **Shadow Brook:** A high invertebrate diversity comprising mostly common species with the exception of locally common leech and caddisfly. Based on the biological and environmental data collected, Shadow Brook was of moderate overall quality;
- **Holywell Brook:** A moderate invertebrate diversity of common and widespread species. Based on the biological and environmental data collected, Holywell Brook was of moderate overall quality.

8.5.27. None of the ponds potentially affected by the proposed scheme were surveyed for aquatic invertebrates as part of these studies. Surveys for these ponds are proposed for 2018.

8.5.28. The assessment has concluded that the overall quality of these water bodies is unlikely to have changed over the intervening period, and accordingly further surveys are not considered necessary as part of the assessment of the proposed scheme. Aquatic invertebrates are, therefore, considered to be of up to Borough value.

8.5.29. Water quality sampling is currently being undertaken as part of wider assessments into the potential effects of the proposed scheme on the water environment (see Chapter 13). In the event that these surveys indicate a change in the overall water quality of Holywell Brook and/or Shadow Brook, the need to update the aquatic invertebrate baseline will be explored further as part of the biodiversity assessment.

*Fish*

8.5.30. Fish surveys undertaken as part of the HS2 project in 2013 (HS2, 2013) concluded that Holywell Brook and Shadow Brook have poor fish habitat quality, with no notable fish species being recorded.

8.5.31. The assessment has concluded that the value of these water bodies is unlikely to have changed (increased) over the intervening period, and accordingly further fish surveys are not considered necessary as part of the assessment of the proposed scheme.

8.5.32. Based on this information, fish are considered to be Site value only and have, therefore, been scoped out of the assessment.



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### *Fungi*

- 8.5.33. A fungi survey was undertaken and reported for Aspbury's Copse pLWS in 2015 as part of the planning application for the Extra MSA. This survey reported moderately high species richness across Aspbury's Copse and identified species present that are typical of being ancient.
- 8.5.34. As no species on the red data list of threatened British fungi were recorded in these surveys; it has been concluded that the woodland is of County value for fungi.

### *Lichens*

- 8.5.35. A lichen survey was undertaken and reported as part of the planning application for the Extra MSA. This reported that the eastern half of Aspbury's Copse supported relatively common and widespread lichen species, with the western parts supporting a richer diversity of lichen species including three nationally scarce species: *Bacidia fresiana*, *B sulphurella* and *Normadina pulchella*. It has been concluded that these lichen species are of Regional value.

### *Flora*

- 8.5.36. The desk study identified records of black poplar within the study area; however, none of these were confirmed during the Phase 1 habitat survey or Woodland NVC surveys (see Appendix 8A and 8G). The field surveys recorded Poplar species and hybrid black poplar.
- 8.5.37. Black poplar is not a habitat of principal importance (HPI), but is a LBAP species. As there are almost 600 records in Warwickshire, the species is considered to be of up to Regional value. The desk study identified two locations of Black poplar in the vicinity of the proposed scheme as follows:
- Eastern edge of Aspbury's Copse; and
  - To the south east of M42 Junction 6.
- 8.5.38. These locations would not be impacted upon by the proposed scheme works, and as such Black Poplar is not considered further within the assessment.

### *Controlled Weed Species*

- 8.5.39. Four stands of Japanese knotweed are present within the study area. One stand is located adjacent to pond 39 north of Solihull Road, and is within the proposed scheme footprint. Three stands are located south west of Bickenhall, the closest of these being located approximately 160m west of the proposed scheme.
- 8.5.40. Water fern covered the entire surface of Pond 36 which is located approximately 330m east of the proposed scheme.
- 8.5.41. Confirmatory invasive plant surveys are to be undertaken to reconfirm the presence or absence of controlled weed species.

## **8.6. Potential Impacts**

### **Construction Phase**

#### *Statutory Nature Conservation Designations*

- 8.6.1. Whilst the proposed scheme is not anticipated to have a direct impact upon statutory nature conservation designations, there is the potential for indirect impacts on the following statutory designation site due to emissions to air during proposed scheme

construction, and interception of ground or surface water as a result of proposed scheme construction and then long-term operation:

- Bickenhill Meadows SSSI;
- River Blythe SSSI; and
- Coleshill and Bannerly Pools SSSI.

8.6.2. Given the above, at this stage it is considered that there is potential for all three statutory nature conservation designated site to experience a significant effect at the national level. The potential effects associated with the impacts on the sites will be assessed further, with the results presented in the ES, together with proposed mitigation measures which will aim to reduce the effect significance.

*Non Statutory Nature Conservation Designations*

Aspbury's Copse /pLWS (P1)/Ecosite (49/18)

8.6.3. There is the potential for a direct impact on Aspbury's Copse pLWS (P1)/ Ecosite (49/18) from construction of the proposed scheme due to:

- Impacts on soil structure and composition within the ancient woodland;
- Impacts upon the integrity of the remaining woodland and its component botanical, fungal and lichen interest;
- Where areas of the woodland can be retained without loss of trees, they may still experience temporary ground disturbance and possible damage;
- Alteration to hydrological regimes supporting the woodland; and
- Dust emissions from construction activities (refer to Chapter 5: Air Quality).

8.6.4. Land take within Aspbury's Copse is estimated at approximately 0.4 ha of the total 2.6ha woodland area.

8.6.5. In the absence of specific mitigation, the potential impact upon Aspbury's Copse is considered major and the potential effect considered significant at the County level.

Holywell Brook pLWS

8.6.6. There is the potential for direct and indirect impacts on Holywell Brook pLWS (P13). The proposed bank works would result in a direct impact due to land take and changes to the bankside and bank-top habitats. The widening of the existing bridge structure would also result in a small increase in habitat isolation and severance, as there would be a greater width of built structure between the upstream and downstream sections of Holywell Brook. However, this is unlikely to impact the integrity of the watercourse, as the existing flow regime would be maintained and no brook realignment would be required.

8.6.7. In addition, an area of approximate 3.5ha within Holywell Brook pLWS is currently being explored as a flood compensation area. This is not expected to require any earthworks in the pLWS, but the potential impacts of this cannot be established at present and need further hydrological and ecological assessment.

8.6.8. The potential effect of the above impacts on Holywell Brook is assessed as significant at the County level (moderate) without specific mitigation.

Castle Hill Farm Meadows LWS (L2)

8.6.9. Construction of the proposed scheme would result in the loss of approximately 0.4ha (0.6% of the total LWS area of 63ha) of nationally rare MG5 crested dog's-tail and

lesser knapweed MG5 grassland – this is unlikely to impact the integrity of the remaining habitats, as the land taken would be at the periphery of the LWS and would not cause severance of the remaining grassland.

- 8.6.10. There is also the potential for indirect impacts due to potential dust emissions and changes to groundwater and surface water throughout the proposed scheme construction phase. In the absence of specific mitigation, the potential effect of the above impacts on Castle Hill Farm Meadows LWS (L2) is assessed as significant at the Regional level (large).

Barber's Coppice Ecosite (05/18)

- 8.6.11. There is the potential for indirect impacts due to potential dust emissions and changes to groundwater and surface water throughout the proposed scheme construction phase. At present, it is considered that there is potential for Barber's Coppice Ecosite to experience a significant effect at the Borough level (moderate) without specific mitigation.

**Remaining Relevant Non-statutory Designations**

- 8.6.12. At present, none of the other relevant non-statutory designations would experience direct impacts due to the proposed scheme. However, further assessment will be undertaken to identify the potential for indirect impacts.

*Broadleaved Semi-natural Woodland*

- 8.6.13. There is the potential for a direct impact on broadleaved semi-natural woodland from permanent land take for construction of the proposed scheme. Aspbury's Copse (pLWS/ Ecosite) has been considered and assessed in the preceding section.

- 8.6.14. In addition to the loss of approximately 0.4ha at Aspbury's Copse, approximately 0.8ha of broadleaved semi-natural woodland located to immediate east of Four Winds Farm would be lost as a result of the proposed scheme. Construction of the proposed scheme would thus result in the potential permanent loss of approximately 1.2ha of broadleaved semi-natural woodland of up to County value. The potential effect of the above impact on broadleaved semi-natural woodland is assessed as significant at up to County level (moderate) without specific mitigation.

*Scattered and Dense/Continuous Scrub*

- 8.6.15. Construction of the proposed scheme would result in the loss of small areas of scattered and dense/ continuous scrub adjacent to the existing M42 and A45, located within a wider area of amenity grassland and in semi-improved grassland. The total area of habitat lost is estimated to be between approximately 2ha and 2.5ha, noting that the land required for temporary and permanent land take and any associated development is yet to be finalised. The potential effect of the above impact on scrub is assessed as significant at the Local level (slight) without specific mitigation.

*Hedgerows*

- 8.6.16. At present 18 hedgerows are located on the proposed scheme alignment and it is assumed the sections impacted directly would be lost or would otherwise be severed as a consequence of proposed scheme construction.

- 8.6.17. At present it is not possible to quantify the full length of hedgerow that would be subject to permanent land take, and the length subject to temporary land take with potential for reinstatement after construction. As such, direct impacts to the affected hedgerows and

to the functional integrity of the wider hedgerow network will be confirmed within the ES. The potential effect of the above impacts on the combined hedgerow network is assessed as significant at the County level (moderate) without specific mitigation.

#### *Arable*

8.6.18. It is estimated that up to approximately 12ha of arable land would be permanently lost due to proposed scheme construction. Arable field margins, if present, are of conservation value and are important sources of food for invertebrates and farmland birds, whilst there is the potential for associated loss of these margins as a result of construction activities. The potential effect of the above impact on arable grassland is assessed as significant at the Local level (slight) without specific mitigation.

#### *Semi-improved Neutral Grassland*

8.6.19. There are two areas of semi-improved neutral grassland that are situated on the proposed scheme alignment. One area is located to the immediate south west of Bickenhill and includes parts of Castle Hill Meadows LWS. The potential impact upon Castle Hill Meadows LWS has been assessed above.

8.6.20. The remaining area of semi-improved neutral grassland is located to the immediate north west of the proposed 'new southern junction' off the M42. It is assumed that construction of the proposed scheme would result in the permanent loss of up to approximately 12.5ha of semi-improved neutral grassland. Small areas of this habitat are present in the wider landscape which is dominated by arable fields with frequent fields of improved grassland.

8.6.21. The potential impact on semi-improved neutral grassland is assessed as significant at the Local level (slight) without specific mitigation.

#### *Running Water*

8.6.22. The proposed scheme would cross Holywell Brook, the River Blythe, Grand Union Canal and Shadow Brook. Proposed Scheme impacts upon Holywell Brook, the River Blythe and Grand Union Canal have been assessed above. It is assumed that the banks of Shadow Brook would not be directly affected by the proposed scheme, although there would be potential indirect impacts from interception of surface or groundwater during construction. The potential effect of the above impacts on running water is assessed as significant at the Borough level (moderate) without specific mitigation.

### **Protected Species**

#### *Bats*

8.6.23. There is the potential for proposed scheme construction to impact on bats from:

- Loss of roosting habitat;
- Direct loss of foraging and commuting habitat;
- Loss of access to foraging, commuting and roosting habitat from habitat severance (both physical severance and from other barriers e.g. lighting); and
- Reduction in foraging habitat quality from a variety of factors associated with changes in baseline habitat conditions and quality.

8.6.24. Surveys completed up to the time of writing have found no bat roosts in the study area. Emergence/ re-entry surveys of trees and structures with bat roost features are

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continuing into 2018, as such the assessment of the potential impacts to bats roosting activities will be presented within the ES.

- 8.6.25. Clearance of woodland, scrub and hedgerows would result in the loss of bat foraging areas forcing them to find alternative feeding areas which may be further away from their roosting sites. Impacts of vegetation clearance upon bats will be reported in the ES using collected bat transect data.
- 8.6.26. It is likely artificial lighting would be required during proposed scheme construction activities, in addition to possible night time security lighting around the perimeter of the construction area. This additional lightning has the potential to impact upon bat foraging routes. The implications of any construction lighting will be reported in the ES when construction methods, locations and requirements are defined. The potential effect of the above impacts on bats is assessed as significant at the County level (moderate) without mitigation.

*Badger*

- 8.6.27. [REDACTED] The clearance of woodland, scrub, hedgerows, grassland and arable fields has the potential to result in the loss of setts, loss of foraging habitat and severance of territories. The potential effect of the above impacts on badgers is assessed as significant at the Local level (slight) without specific mitigation.

*Otter*

- 8.6.28. Otters are likely to use Holywell Brook, River Blythe, Grand Union Canal Shadow Brook within the zone of influence of the proposed scheme.
- 8.6.29. Construction of the proposed scheme may result in loss of, and obstruction of, access to otter holts (breeding places), resting places and commuting/ foraging habitat on Holywell Brook, River Blythe and Shadow Brook. Otters typically have large home ranges, in the order of 11km to 18km of a main river and its associated tributaries. The potential loss of habitat would be small relative to the typical home range of otters. The potential effect of the above impacts on otters is assessed as significant at the Borough level (moderate) without specific mitigation.

*Birds*

- 8.6.30. There is the potential for indirect impacts on birds from extensive habitat loss due to the proposed scheme construction. Trees, woodland, hedgerows, grassland, arable fields and waterbodies provide suitable nesting and foraging habitat for breeding birds and provide suitable foraging habitat for wintering birds. Clearance of trees, woodland, hedgerows, grassland, arable fields and waterbodies would result in loss of bird nesting and foraging habitat. Survey work is ongoing so it is not yet possible to assess the relative importance of the study area for breeding and wintering birds and to assess the effects of habitat loss due to proposed scheme construction. Clearance of vegetation has the potential to represent a direct effect on breeding birds in contravention of the Wildlife and Countryside Act 1981 (as amended).
- 8.6.31. The potential effect of the above impacts on birds is assessed as significant at the Borough level (moderate) without specific mitigation.

*Great Crested Newt*

- 8.6.32. There is the potential for indirect impacts on great crested newts from loss of foraging areas, potential hibernation habitats and severance of habitat connectivity. There are

35 ponds within 500m of the proposed scheme alignment. Small populations of great crested newts were recorded in five ponds between 260m and 500m from the proposed scheme alignment during surveys in 2017, none of which would be lost due to proposed scheme construction.

8.6.33. Hedgerows, dense scrub and woodland across the study area are suitable for foraging and sheltering amphibians. The potential disruption to amphibian mobility will be assessed and presented within the ES when a better appreciation of the loss of hedgerow is known.

8.6.34. The potential effect of the above impacts on great crested newts is assessed as significant at the County level (moderate) without specific mitigation.

#### *Terrestrial Invertebrates*

8.6.35. Unimproved grassland, woodland and marshy grassland have potential to support invertebrate assemblages of up to Borough value. Construction of the proposed scheme would require clearance of approximately 1.2ha of woodland comprising:

- Approximately 0.4ha of the total 2.6ha woodland area in Aspbury's Copse pLWS; and
- Approximately 0.8ha of a woodland east of Catherine De Barnes Lane (to the east of Four Winds Farm).

8.6.36. Clearance of woodland would result in the loss of foraging habitat and has the potential to impact upon invertebrate populations.

8.6.37. Terrestrial invertebrate surveys in Aspbury's Copse pLWS completed in 2015 for the proposed Extra MSA found the pLWS supported a number of notable invertebrate species. The reduction in the woodland has the potential to result in a temporary reduction in terrestrial invertebrate population size, but is unlikely to result in population loss.

8.6.38. Given the large size of invertebrate populations, this is unlikely to affect maintenance of favourable conservation status of common and widespread species. However, it may affect maintenance of favourable conservation status of notable species which are less abundant. The potential effect of the above impacts on terrestrial invertebrates is assessed as significant at the Borough level (moderate) without specific mitigation.

#### *Aquatic Invertebrates*

8.6.39. There is the potential for indirect impacts on aquatic invertebrates from interception of ground or surface water in Holywell Brook and Shadow Brook. Interception of groundwater by the construction of sub-surface barriers may lead to drying. Changes in frequency and volume of discharge to waterbodies may affect their hydrological regime and hence their water quality and species composition.

8.6.40. The potential effect of the above impacts on aquatic invertebrates is assessed as significant at the Borough level (moderate) without specific mitigation.

#### *Fungi*

8.6.41. There is the potential for a direct impact on fungi through ancient woodland habitat loss in Aspbury's Copse pLWS. The habitat loss may result in the loss of rare notable fungi species. There is also the potential for indirect impacts including loss/ disturbance to supporting soil structure, changes in microclimates, increased light incursion from tree loss, increased depth of penetration of air pollution from the M42 in to the woodland

and minor changes in air quality from construction. The potential effect of the above impacts on fungi is assessed as significant at the County level (moderate) without specific mitigation.

#### *Lichen*

8.6.42. There is the potential for a direct impact on lichen through ancient woodland habitat loss in Aspbury's Copse pLWS. The habitat loss may result in the loss of rare notable species. There is also the potential for indirect impacts including changes in microclimates, increased light incursion from tree loss, increased depth of penetration of air pollution from the M42 in to the woodland and minor changes in air quality from construction. The potential effect of the above impacts on lichen is assessed as significant at the Regional level (large) without specific mitigation.

### **Operation Phase**

#### *Statutory Nature Conservation Designations*

8.6.43. There is the potential for indirect impacts from traffic emissions to air during proposed scheme operation on the following statutory nature conservation designations:

- Bickenhill Meadows SSSI;
- River Blythe SSSI; and
- Coleshill and Bannerly Pools SSSI.

8.6.44. The potential effect of the above impacts on the above statutory designations will require further assessment and will be reported in the ES. Pending this, it is considered that there is potential for all three statutory nature conservation designations to experience a significant effect at the national level (very large) without specific mitigation.

#### *Non-Statutory Nature Conservation Designations*

##### Holywell Brook pLWS (P13)/Ecosite (76/28)

8.6.45. There is the potential for an indirect impact from increased shading from the widened motorway on Holywell Brook pLWS (P13)/Ecosite (76/28). This effect is considered to be significant at the County level (moderate) without specific mitigation.

8.6.46. There is the potential for indirect impacts on the following non-statutory designations from traffic emissions to air:

- Main Birmingham to London Railway Line Ecosite (21/18);
- Hen Wood and Hen Wood Meadow LWS (L20);
- Disused Railway & Sidings pLWS (25/28B);
- Coleshill Pool Wood LWS (07/18);
- Catherine De Barnes Meadows Ecosite (36/18);
- Greens Ward Piece LWS (L7) (part of Shadowbrook Lane Meadows Warwickshire Wildlife Trust (WWT) Nature Reserve) / Ecosite (37/18) - referred to as Shadowbrook Meadows Nature Reserve in Chapter 12 Wayside Cottages Meadow LWS (55/18);
- Pendigo Lake & The Rough Ecosite (33/18);
- Marsh adjacent to River Blythe pLWS (P16);
- Henwood Mill LWS (L10);
- Land by Henwood Tip pLWS (P15);

- Pond at Hampton Manor Wood North pLWS (P20)/ Hampton Manor Grounds & Churchyard & Hampton-in-Arden Spinney Ecosite (70/28);
- Denbigh Spinney LWS (L4); and
- Bickenhill Plantation LWS (L1).

8.6.47. The potential effect of the above impacts on the above non-statutory designations will require further assessment and will be reported in the ES. Pending this, it is considered that there is potential for all the non-statutory nature conservation designations to experience a significant effect of up to County level (moderate) without specific mitigation.

### **Protected Species**

#### *Bats*

8.6.48. There is the potential for increased bat mortality associated with vehicle collisions during proposed scheme operation. The new road would sever six potential bat commuting routes. Most species of bat fly relatively close to the ground or close to trees and hedges for protection against the weather and potential predators. Those that cross roads typically do so at traffic height, with a high risk of collision.

8.6.49. Proposed scheme operation would result in a significant increase in ambient lighting levels from street lights and vehicle headlights. Bats are particularly sensitive to increased lighting, which can affect the availability and quality of foraging habitat. The potential effect of the above impacts on bats is assessed as significant at the County level (moderate) without specific mitigation.

#### *Badger*

8.6.50. There is the potential for an impact on badgers from mortality associated with vehicle collisions during proposed scheme operation, [REDACTED]. Operation of the proposed scheme would result in a significant increase in ambient lighting levels from street lights and vehicle headlights. Badgers are sensitive to increased lighting, which can affect their use of foraging habitat. The potential effect of the above impacts on badgers is assessed as significant at the Local level (slight) without specific mitigation.

#### *Otter*

8.6.51. There is the potential for an impact on otters from increased mortality associated with vehicle collisions during proposed scheme operation. The operation of the proposed scheme would result in a significant increase in ambient lighting levels from street lights and vehicle headlights. Otters are sensitive to increased lighting, which can affect their use of foraging habitat. The potential effect of the above impacts on otters is assessed as significant at the Borough level (moderate) without specific mitigation.

#### *Hedgehog*

8.6.52. There is the potential for an impact on hedgehogs from mortality associated with vehicle collisions during proposed scheme operation. The operation of the proposed scheme would result in a significant increase in ambient lighting levels from street lights and vehicle headlights. Hedgehogs are sensitive to increased lighting, which can affect their use of foraging habitat. The potential effect of the above impacts on hedgehogs is assessed as significant at the Borough level (moderate) without specific mitigation.



### *Fungi*

8.6.53. Some fungi are sensitive to air pollution. There is thus the potential for indirect impacts from traffic emissions to air on fungi within retained woodland in Aspbury's Copse pLWS. The potential effect of the above impacts on fungi is assessed as significant at the County level (moderate) without specific mitigation.

### *Lichen*

8.6.54. Some lichens are sensitive to air pollution. There is thus the potential for indirect impacts from traffic emissions to air on lichen within retained woodland in Aspbury's Copse pLWS. The potential effect of the above impact on lichen is assessed as significant at the Regional level (large) without specific mitigation.

## **8.7. Design, Mitigation and Enhancement Measures**

8.7.1. Environmental considerations have been taken into account during the development of the proposed scheme design, in order to reduce and/or avoid potential biodiversity impacts. This iterative approach has led to a range of mitigation measures capable of reducing the magnitude of impacts being embedded within the proposed scheme design or captured within the proposed construction practices. However, given the status of the proposed scheme design and ongoing ecological surveys, the assessment of proposed scheme effects upon biodiversity is also ongoing. As such, the mitigation measures needed to reduce biodiversity effects are still under development. Nevertheless, the sections below provide a range of mitigation measures currently under consideration.

8.7.2. The Highways England Biodiversity Plan<sup>29</sup> states that by 2020, Highways England must deliver no net loss of biodiversity and that by 2040 it must deliver a net gain in biodiversity. These objectives will be implemented as far as reasonably practicable to do so when designing the proposed scheme and its associated mitigation, and when considering options for additional ecological enhancements that could be delivered as a result of the proposed scheme.

8.7.3. Monitoring and mitigation measures will be discussed with the relevant stakeholders as the proposed scheme design continues to develop – such stakeholders will be given the opportunity to provide comment as part of on-going consultation.

8.7.4. As part of the mitigation design for the proposed scheme, where required, monitoring measures will be proposed to assess the effectiveness of the mitigation proposals.

### **Construction and Operation Phase**

#### *Non-Statutory Nature Conservation Designations*

8.7.5. It is not possible to compensate for loss of ancient woodland, as this is an irreplaceable habitat - as such, the following mitigation measures would be provided:

- Provision of new high quality native woodland planting to create replacement woodland of a greater area than that lost.
- Retention, appropriate temporary storage and reinstatement of ancient woodland top soils removed during proposed scheme construction. There would be a need to retain the ancient woodland seedbank, whilst this would be the only measure

<sup>29</sup> <https://www.gov.uk/government/publications/biodiversity-plan>

available to attempt to retain some of the baseline fungal interest associated with these soils.

- Specification of appropriate aftercare and long term management requirements going forward to deliver biodiversity objectives.
- Ancient woodland protection and management requirements would be specified within the outline EMP for inclusion within the contractors CEMP, and where required in the Handover Environmental Management Plan (HEMP).

8.7.6. There is the potential for permanent ongoing indirect impacts on relevant statutory and non-statutory nature conservation designations from emissions to air during proposed scheme operation. Further assessment is needed to quantify the nature and scale of the potential biodiversity impact from traffic emissions. Options to mitigate such operational phase emissions to air from traffic are limited. New woody plantings could be located and orientated to improve buffering of sensitive ecological features (e.g. new plantings that would buffer ancient woodland once established). But any such specifications would need to be on the understanding that there is little evidence to demonstrate the effectiveness of such mitigation. Any such plantings and requirements for aftercare and longer term management would be detailed in the HEMP.

#### Castle Hill Farm Meadows LWS

8.7.7. Habitat loss from Castle Hill Farm Meadows is considered unavoidable, but the configuration of the proposed scheme restricts this to a peripheral area and therefore would avoid wider consequences for site management. Habitat compensation could be provided to mitigate for the loss of species-rich grassland, with requirements to be agreed in consultation with relevant stakeholders. The compensation approach could involve a combination of turve translocation from the original grassland area, and ideally use of seed or green hay derived from the wider LWS to supplement this and to allow creation of a larger area of new grassland relative to that impacted. Appropriate aftercare and long term management requirements would also be agreed with stakeholders to deliver biodiversity objectives.

#### Broadleaved Semi-natural Woodland

8.7.8. As broadleaved semi-natural woodland loss would be unavoidable, the following mitigation measures would be provided:

- Provision of new high quality native woodland planting to create replacement woodland of a greater area than that lost;
- Retention, appropriate temporary storage and reinstatement of ancient woodland/ broadleaved semi-natural woodland top soils removed during proposed scheme construction. This is needed to retain the ancient woodland/ broadleaved semi-natural woodland seedbank, and would be the only measure available to attempt to retain some of the baseline fungal interest associated with these soils;
- Specification of appropriate aftercare and long term management requirements going forward to deliver biodiversity objectives; and
- A broadleaved semi-natural woodland protection and management plan would be provided within the outline EMP and HEMP.

#### Semi-improved Neutral Grassland

8.7.9. The grassland identified that would be lost to the proposed scheme is of relatively low nature conservation value and subject to agricultural management as pasture. This

loss could be avoided given the configuration of the proposed scheme. Replacement pasture cannot be accommodated within the proposed scheme, but in general due to the nature of the proposed scheme being in cutting, new verges, embankments and cuttings could be sown with comparable grass seed mixes and managed at low intensity. Supplementing these sowings with additions of seeds of native wildflowers would be considered where there is sufficient potential for favourable management to provide confidence that this flora could be maintained and provide a biodiversity value over the longer term.

- 8.7.10. More diverse species-rich grassland would be provided to compensate for the loss of species-rich grassland from Castle Hill Meadows LWS, as described above.

#### Running Water

- 8.7.11. Pollution measures to protect watercourses would be specified in the outline EMP for inclusion within the contractors CEMP (also refer to Chapter 13: Road Drainage and Water Environment).

#### Hedgerows

- 8.7.12. The permanent losses of hedgerow are considered unavoidable, given the widespread presence of hedgerows in the landscape crossed by the proposed scheme. Works would be planned as far as possible to avoid the need for temporary land take from hedgerows. Where loss and severance of hedgerows is unavoidable then the following mitigation measures would be considered to deliver compliance with relevant policy:

- New hedgerows would be planted to replace losses and to deliver a net increase in hedgerow length and connectivity overall. Specification of appropriate aftercare and long term management requirements going forward to deliver biodiversity objectives; and
- Hedgerow protection and management requirements would form part of the draft CEMP and HEMP.

#### *Protected Species*

#### Bats

- 8.7.13. The construction impacts of the proposed scheme on bats relate to the potential direct loss of habitat (roosting sites (if identified in 2018) and foraging areas), severance of habitat features and lighting.

- 8.7.14. Given the dynamic nature of bat roost selection and use, the use of roosting sites along the proposed scheme may vary over time. Further surveys of bat roost potential and/or bat activity will therefore be undertaken to update the baseline information in advance of construction. All trees with potential roost features of moderate to high potential would be surveyed further to determine the presence/absence of bat roosts. The resultant data would be used to inform requirements for mitigation.

- 8.7.15. The scale of the loss of bat habitats due to the proposed scheme will be quantified when survey data is available. However, on the basis of the currently available data, habitat losses would be mitigated through:

- Provision of new hedgerows, grassland and woody plantings as described above.
- Design of balancing and attenuation ponds and wetlands to include ancillary benefits for biodiversity, including bats.

- Where required and appropriate, temporary linear features to maintain some connectivity where habitats have been severed, and while subsequent reinstatement plantings are establishing.
- Construction lighting would be specified to minimise potential for impact on bats, and would be directed carefully to avoid incidental light spill and glare onto adjacent habitats. Lighting requirements, and associated measures to minimise potential impacts on bats, would be specified in the outline EMP.

#### Badger

8.7.16. Requirements for mitigation cannot be determined until the necessary baseline badger surveys have been undertaken. However, if mitigation measures are required to reduce the impact to badgers, the following measures will be explored:

- Provision of artificial replacement main setts for all main setts that would be lost, damaged or otherwise compromised by the proposed scheme.
- Provision of green corridors to allow movement across the wider landscape.
- Where applicable, mammal crossings across the proposed new road.

#### Otter

8.7.17. Further confirmatory otter surveys would be undertaken as appropriate in the run up to construction to re-confirm the presence/absence of otter holts and resting places. However, if mitigation measures are required to reduce the impact to otter, the following measures will be explored:

- Provision of green corridors to allow movement across the wider landscape.
- Where applicable, mammal crossings across the proposed new road.

#### Birds

8.7.18. Mitigation measures for birds, and to deliver legal compliance, include:

- Tree, scrub and hedgerow clearance works would be undertaken outside the main breeding bird season of March to August inclusive.
- Where clearance of habitats suitable for nesting cannot be timed to avoid the main bird breeding season, then habitat clearances would be undertaken under the supervision and instruction of an ecological clerk of works.
- Once land has been cleared of vegetation, it would be maintained in a disturbed state in the run-up to construction works starting to minimise the risk of ground nesting birds establishing. This approach would also be applied in arable fields.
- All tree cavities suitable for use by nesting barn owl would be inspected by a licenced barn owl surveyor. Any requirement for further mitigation would be specified as relevant based on the results of the survey.
- Provision of new ponds, hedgerows, grassland and woody plantings as described above.
- Design of balancing and attenuation ponds and wetlands to include ancillary benefits for biodiversity, including birds.

#### Great Crested Newt

8.7.19. Requirements for mitigation cannot be fully determined until impacts to ponds and suitable habitats due to the proposed scheme are understood. In the event that great

crested newt mitigation is required, new ponds, hedgerows, grassland and woody planting would be proposed in strategic locations around the proposed scheme to encourage great crested newt growth and population mobility.

#### Terrestrial and Aquatic Invertebrates

8.7.20. Pending the results of the terrestrial invertebrate survey, it is assumed that all invertebrate mitigation would be achieved through the provision of new ponds, hedgerows, grassland and woody plantings, and other habitat mitigation.

#### Fungi and Lichen

8.7.21. Mitigation of impacts to fungi and lichen assemblages associated with ancient woodland would be achieved through:

- Retention, appropriate temporary storage, and appropriate reinstatement of all top soils removed during construction works in ancient woodland.
- Salvage, appropriate temporary storage and reinstatement of all substantive fallen and standing deadwood associated with the ancient woodland. Where there is opportunity through appropriate woodland management to increase the availability of standing deadwood (e.g. through bark ringing of non-native trees), then this would be considered.
- Agreement of an Ancient Woodland Reinstatement and Management Plan covering the construction phase and an appropriate period, subject to agreement with relevant stakeholders, thereafter.

8.7.22. New woodland planting, as described above, to compensate for some of the tree loss from ancient woodland, but recognising that it is not possible to replicate ancient woodland.

### **8.8. Assessment of Effects**

8.8.1. In the absence of mitigation, there is the potential for significant biodiversity effects to be generated as a result of the proposed scheme construction and operation activities. These effects range from impacts to habitats and individual species with differing levels of importance.

8.8.2. Following completion of the surveys as detailed herein, and finalisation of the proposed scheme design, biodiversity mitigation measures will be confirmed taking account of Highway England's no net loss to biodiversity objective. With appropriately designed mitigation, it would be envisaged that some of the potential significant effects highlighted herein could potentially be reduced to no-significant levels. However, this will be confirmed and reported in the ES.

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## 9. SOILS, GEOLOGY AND GROUNDWATER

- 9.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on geological and soils resources. The assessment also considers the potential effects on controlled waters, minerals, contaminated land and designated geological sites.
- 9.1.2. The approach to the assessment and the methods being used to identify potentially significant effects on geology and soils are set out in the M42 Junction 6 Improvements EIA Scoping Report.
- 9.1.3. In summary, the process of scoping identified that the construction and/or operation of the proposed scheme could result in the following:
- **Physical effects:** associated with changes in topography, soil compaction, soil erosion, landtake and ground stability.
  - **Effects on geological resources:** associated with sterilisation of mineral resources, and the loss of (or damage to) designated sites of geological importance.
  - **Effects associated with contamination:** through introducing or changing pathways of contamination migration which could alter the characteristics of the following receptors:
    - **Human health:** Construction and maintenance workers, offsite receptors and future site users.
    - **Controlled waters:** Groundwater and surface water features.
    - **Construction materials:** Existing and new concrete and structures associated with the highway.
    - **Sensitive sites:** Mining and mineral resources.
    - **Property:** Comprising residential and commercial properties, agricultural crops, livestock and infrastructure such as below ground utilities.
  - **Effects from polluting substances:** associated with new ground contamination issues on site, such as the accidental loss/spillage of fuels and oils to ground during construction and operation.
  - **Effects associated with re-use of soils and waste soils:** through the re-use of site-sourced materials (on- or off-site), disposal of site-sourced materials off-site and importation of materials to the site.
- 9.1.4. Construction and operational maintenance of the proposed scheme would be undertaken in a manner that appropriately protects the health and safety of workers. Furthermore, materials, processes and working methods used would be appropriate for the identified ground conditions. On this basis, scoping identified that effects on construction and maintenance workers and construction materials did not require consideration in the assessment, given that the measures described in Section 9.7 would be implemented by the contractor and maintaining agents as standard best practice.
- 9.1.5. Scoping concluded that there is low likelihood for the proposed scheme to result in significant adverse effects with respect to geology and soils, and that a simple assessment would be sufficient to establish its effects on these resources. Notwithstanding this, scoping identified that an intrusive ground investigation would be

necessary due to the potential for contaminants to be mobilised or displaced during the construction or operation of the proposed scheme.

- 9.1.6. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of effects on geological and soils resources associated with highway-based improvements.

## **9.2. Stakeholder Engagement**

- 9.2.1. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the geology and soils assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- An assessment of the possible effects on construction and maintenance workers as a result of contamination and waste disturbance at historical landfill sites; and
- An Agricultural Land Classification Assessment to inform the ES.

- 9.2.2. Consultation will be undertaken with SMBC and local geological groups as part of the assessment to identify any local sites of geological interest and relevance to the proposed scheme. Liaison will also be carried out with potentially affected landowners as part of agricultural and land surveys, in order to establish the current quality and grade of agricultural soil resources.

- 9.2.3. The final extents of the assessment study area(s) (refer to Section 9.4) will be agreed in consultation with relevant consultees and subsequently confirmed as the assessment is undertaken and refined.

## **9.3. Assessment Assumptions and Limitations**

- 9.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.

- 9.3.2. No intrusive ground investigation or Agricultural Land Classifications (ALC) soil survey has been undertaken to date. Both surveys will be undertaken to establish the prevailing conditions and inform the identification and assessment of potential constraints relating to geology and soils. Accordingly, information used to establish the baseline conditions of the receiving environment within this preliminary assessment has been based on available published information and records.

- 9.3.3. The findings of the preliminary assessment may be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further research and investigative surveys are undertaken to fully understand its potential effects.

## **9.4. Study Area**

- 9.4.1. The process of scoping identified that potential physical effects, such as the loss of agricultural land, would be generally confined to land within the proposed scheme boundary.

- 9.4.2. A 250m study area around the proposed scheme boundary was, however, defined to enable an assessment of potential effects in a wider context. This was extended to 500m specifically for the assessment of potential effects on groundwater and surface water, to align with that adopted in the assessment presented in Chapter 13: Road Drainage and the Water Environment.

## 9.5. Baseline Conditions

9.5.1. The following tasks have been undertaken to date in the assessment to establish the baseline conditions that exist within the adopted study areas:

- A review of relevant legislation, planning policy and guidance concerning: the conservation and protection of soil, geological, hydrological and minerals resources; and land affected by contamination.
- Desk-based review of: solid and drift geological mapping (published by the British Geological Survey (BGS)); Ordnance Survey mapping; aerial photography; ALC maps (from the MAGIC website); historic landfill records and hydrological information (from the EA website); and geodiversity, materials and borehole information available from Warwickshire Geological Conservation Group (WGCG), Warwickshire County Council (WCC) and the BGS.
- A review of available reports comprising: an Envirocheck Report (published by the Landmark Information Group); historic factual and interpretative reports and borehole logs; and reports commissioned to identify the potential for unexploded ordnance to be present.
- A review of published studies undertaken to inform route optioneering and selection at PCF Stage 2.
- A site survey undertaken by AECOM on 14th and 15th September 2017 to inform the scope of future ground investigations.

### Designated Sites

9.5.2. There are no nationally important geological SSSIs within the 250m study area.

9.5.3. One Local Geological Site (LGS) (formerly Regionally Important Geological Sites (RIGS)) has been identified within the 250m study area; this relates to Nursery Cottage (Arden) Brickworks (also known as 'Jacksons (Warwickshire)') – a large active brickworks located south of the A45 between the M42 Junction 6 and Stonebridge Island to the east. This LGS is designated as it represents a good example of fresh exposures of the Triassic, Mercia Mudstone Group within the former Warwickshire county boundary.

### Geology

9.5.4. The desk-based review has established the following conditions in respect of solid and drift geology within the 250m study area:

- Made Ground is present to the west of the M42 Junction 6 and the north of the A45 associated with Birmingham International Airport, with some areas further north along the M42 also identified.
- Areas of infilled ground are noted east of the proposed scheme (located south of the A45, between the M42 Junction 6 and Stonebridge Island to the east, and further north near Birmingham Business Park).
- No superficial deposits are recorded across the majority of the proposed scheme study area. Localised strips of alluvium deposits (clay, silt, sand and gravel) intersect the length of the proposed scheme, and glaciofluvial deposits are present in patches across the central part of the proposed scheme footprint with wider expanses south of Hampton Lane Farm and to the north of the M42 Junction 6.



Between Friday Lane and Henwood Lane, the area comprises alluvium, river terrace deposits and glaciofluvial deposits.

- The proposed scheme is entirely underlain by the Mercia Mudstone Group (comprising the Sidmouth Mudstone Formation, Branscombe Mudstone Formation and Arden Sandstone Formation).
- Beneath the topsoil (and where present), materials include Embankment Construction Material, Worked Ground (e.g. from former clay and sand pits), Infilled Ground (e.g. from infilled ponds) and areas of undifferentiated Made Ground (e.g. spoil heaps and areas of former construction) of variable depths.

### **Mining and Mineral Resources**

9.5.5. The desk studies have confirmed that two BGS Recorded Mineral Sites are located within the 250m study area:

- **Arden Landfill:** located approximately 230m from the proposed scheme south of the A45 between the M42 Junction 6 and Stonebridge Island to the east. This is a dormant opencast site for which the commodity is recorded as common clay and shale.
- **Middle Bickenhill Brick Works:** located approximately 70m from the proposed scheme south of the A45 between the M42 Junction 6 and Stonebridge Island to the east. This is a ceased opencast site for which the commodity is recorded as common clay and shale.

9.5.6. One active mineral site is mapped adjacent to the proposed scheme, south of the A45 between the M42 Junction 6 and Stonebridge Island to the east. This relates to Arden Brickworks, for which the commodity is recorded as common clay and shale.

9.5.7. The majority of the proposed scheme south of Park Farm on the A452 lies within a sand and gravel Mineral Assessment Area. One Mineral Planning Permission (Points) is recorded as an active site for common clay and shale south of the A45 between the M42 Junction 6 and Stonebridge Island to the east.

9.5.8. The far northern part of the proposed scheme is within a sand and gravel Minerals Safeguarding Area.

9.5.9. Desk studies have also confirmed that no significant mining has taken place in the study area, and that the underlying strata are not coal bearing.

### **Agricultural Land Classification (ALC)**

9.5.10. Land within the proposed scheme boundary classed as ALC Grade 1, 2 or 3a is considered the best and most versatile in agricultural terms. The ALC map West Midlands Region (1:250,000) indicates that the entire footprint of the proposed scheme area comprises land of ALC Grade 3, and provides no differentiation of sub-grades 3a and 3b.

9.5.11. The MAGIC website provides some further details for farmland west of the M42. This covers the Walford Hall Farm area adjacent to the M42 near Friday Lane, which is classed as mainly Grade 3a and Grade 3b land with a small area of Grade 2 land. Land adjacent to B4438 west side occupied by Bunts Wood, Woodhouse Farm, Hampton Coppice and Castle Hills is mainly Grade 3b but also has areas of Grade 2 and 3a land with a small area of Grade 4 land in the corner adjacent to Damson Parkway.

### **Contamination**

9.5.12. The desk review has identified potential current and historical potential contaminative land uses within the 250m study area, the findings of which are summarised in Table 9.1. The review has focused only on significant features recorded within the study area and excludes landfills and other waste disposal features which are presented separately.

9.5.13. Additionally, the following potential contaminative land uses have been identified from the desk study and site visit which are not included in Table 9.1:

- The M42 motorway;
- The NEC east of Bickenhill (present from approximately mid-late 1970s);
- The London and North Western Railway (indicated from 1886 to present, oriented north west to south east, east of Bickenhill);
- The Midland Railway (present at the eastern extent of the proposed scheme close to the M42 Junction 6 from 1886, and is shown as dismantled in 1970);
- A mineral railway associated with the Jacksons Brickworks (present between 1954 and 1961); and
- Fly-tipped material observed in a wooded area adjacent to the M42 off the B4102 (comprising used tyres and brick rubble).

**Table 9.1: Summary of Potential Contaminative Sources**

	Potential Sources within the Proposed Scheme Boundary 1		Potential Sources within the 250m Study Area 2	
Land Use Type	No.	Land Use	No.	Land Use
Other Contemporary Trade Directory Entries (Envirocheck)	2	Sand, Gravel & Other Aggregates Commercial Cleaning Services	19	Bath Resurfacing (2 entries) Furniture Manufacturers Floor Cleaning & Polishing Equipment - Manufacturers & Distributors Car Accessories Manufacturers Railway station - Birmingham International Salvage Dealers Crane Hire, Sales & Service Cement Manufacturers & Distributors (2 entries) Medical Equipment Manufacturers Concrete Products Freight Forwarders- Now Cargo Ltd Freight Forwarders- First Port Shipping Pottery Manufacturers & Suppliers Concrete & Mortar Ready Mixed Crane Hire, Sales & Service Catering Equipment - Procook Lingerie & Hosiery Manufacturers & Wholesalers
Farm	5	1972 to Present, Glebe Farm	16	Numerous farms present

		1886 to 2006, Cottage Farm 1886 to 1955, Warren Farm 1966 to Present, Myrtle Cottage Farm 1962 to 1977, Common Farm Cottage		
Car Parks	3	NEC Eastern NEC SE1 NEC Southern	13	Several associated with the NEC
Depots	0	N/A	6	1983-1996, Un-named, North-west of proposed scheme 1972 to Present, Un-named, West of proposed scheme 1990 to Present, Brick works Depot, East of proposed scheme 1990 to Present Un-named, East of proposed scheme (adjacent to Myrtle Cottage Farm) Distribution Services - Neowave Distribution Distribution Services - Magnum Distribution
Quarries	0	N/A	5	Mercia Mudstone Group; Common Clay and Shale - Opencast - Arden Landfill Mercia Mudstone Group, Common Clay and Shale - Opencast - Middle Bickenhill Brick Works 2017 to Present, Sand and Gravel Pit, East of proposed scheme 2017 to Present, Conveyors, East of proposed scheme 1886, Quarry identified 60m east of the M42.
Pits/ Ponds and Infilled Ground	0	N/A	4	1978 to Present, Pendigo Lake (man-made), West of proposed scheme 1999 to Present, Pit (disused), East of proposed scheme

				1888 to 1992, Spinney Pool, North west of proposed scheme 1887 to Present, Coleshill Pool, North east of proposed scheme
Works	0	N/A	4	1962 to 1992, Un-named, West of proposed scheme 1948 to 1983, Scaffolding Factory, North-west of proposed scheme 1990 to 2017, Un-named, East of proposed scheme 1972 to 1996, Un-named, South of proposed scheme
Fuel Filling Stations	0	N/A	3	Petrol Filling Stations - Esso (1978 to present) Anne's Pantry Bickenhill Service Station
Electricity Substations	1	1993 to Present/Recent (associated with the National Motorcycle Museum)	4	1993 to Unknown, Un-named, North of proposed scheme (adjacent to Esso Fuel Filling Station) 1993 to Unknown, Un-named, East of proposed scheme 1993 to Unknown, Un-named, North of proposed scheme 1979 to Present, Un-named, West of proposed scheme
Sewage Works	1	2017 to Present Sewage Pumping Station (Clock Lane) East of scheme	2	1886-1968, Sewage Farm Solihull RDC, South-west of proposed scheme 1937 to Present, Birmingham Tame and Rea Drainage Board, East of proposed scheme
Garages	0	N/A	2	1972-1999, Un-named, West of proposed scheme Chris Morgan-Cettler - Garage east of proposed scheme
Industrial Estates	0	N/A	2	1996 to Present, Trinity Park, North of proposed scheme 1999 to Present, Warehouse (Fujitsu), North-west of proposed scheme

Nursery (Horticulture)	1	1961 to Present Braceys Nurseries and Garden Centre	1	1955 to 1992, The Meadows, adjacent to M42 J6
Tanks	0	N/A	2	1983-1996, Tank associated with depot, North-west of proposed scheme 1905-1955, Associated with brick works, East of proposed scheme
Brick Works	0	N/A	1	1904-1990, Un-named, East of proposed scheme
Builder's Yards	0	N/A	1	1978-1981 Un-named, North of proposed scheme
Refuse Tips	0	N/A	1	1990-2017, Un-named, East of proposed scheme
Pit/Tip/Dump <sup>4</sup>	5	Contractors unsuitable tip Agricultural waste dump Previous agricultural waste dump Pit infilled with waste Infilled Ground - Pit partially backfilled with domestic refuse	2	Tip-mainly builders waste Contractors unsuitable tip
Fly Tipping	Two areas of fly-tipped material (both within the proposed scheme) were observed during a site walkover (undertaken on the 14th and 15th September 2017) in the wooded area adjacent to the M42 off the B4102 comprising used tyres and brick rubble			
Anthropogenic Material	Widespread and variable as detailed earlier in this section both within/around the proposed scheme			
Roads	The construction of the M42 motorway (which trends approximately north to south) and the NEC east of Bickenhill is noted from approximately mid-late 1970s. The A45 trends approximately west to east			
Railways	The London and North Western Railway is indicated from 1886 to present oriented NW to SE, east of Bickenhill (crosses the scheme in between the Clock Lane Interchange and the M42 Junction 6). The Midland Railway was present at the eastern extent of the proposed scheme close to the M42 Junction 6 from 1886 and is shown as dismantled in 1970. A mineral railway			

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	associated with the Jacksons Brickworks is present between 1954 and 1961
<p>1 Where reference is made to dates, the feature has been identified from historical land use maps contained within the Envirocheck Report, unless otherwise stated. Where no reference is made to dates, the feature has been identified from the Envirocheck Report datasheets and available current mapping.</p> <p>2 Defined as the area of land beyond the proposed scheme boundary but within the 250m study area.</p> <p>3 It should be noted that there are various historic pits/ponds (some infilled) which are present within/around the proposed scheme; only those significant historic pits/ponds have been recorded</p> <p>4 Identified within historical studies</p>	

9.5.14. A summary of the landfill sites and other waste features within the 250m study area that are potentially contaminative land uses is presented in Table 9.2.

**Table 9.2: Summary of Landfill Sites and Waste Features**

Land Use Type	Waste Features within the Proposed Scheme Boundary		Features within the 250m study area 1	
	No.	Land Use	No.	Land Use
Historic Landfill	7	Glebe Farm Castle Hills Farm Bickenhill Lane Jacksons Brickworks (2 entries) Site Corner Clock Lane Windbridge Nurseries	10	Shadowbrook Lane Friday Lane (3 entries) Walford Hall Farm Opposite Church Farm Hargrave Farm (2 entries) Rear of Jacksons Brickworks Brackenlands Farm
Local Authority Recorded Landfill	5	Castlehill Farm Friday Lane (2 entries) Jacksons Brickworks Mercon Construction	2	Shadow Brook Lane Friday Lane
Registered Landfill Sites	2	Mercon Construction Sheridan Contractors	6	B J O'Reilly & Sons Ltd Bulldog Demolition Ltd Eastcote Nurseries M Fisher/Friday Lane West Midlands Excavation Rawlins Brothers
BGS Recorded Landfill	0	N/A	4	Walford Hall Farm Church Farm Jacksons Brickworks Denbigh Spinney
Licensed Waste Management Facilities (Locations)	0	N/A	2	Operator: Eastcote Nurseries Operator: Enterprise Managed Services Ltd
Licensed Waste Management Facilities (Landfill Boundaries)	0	N/A	4	Operator: Eastcote Nurseries (2 entries) Operator: Sita (2 entries)
1 Defined as the area of land beyond the proposed scheme boundary but within the 250m study area.				

9.5.15. Other pertinent regulated activities within the 250m study area have been reviewed using available information, a summary of which is presented in Table 9.3.



**Table 9.3: Summary of Other Regulated Activities**

	Regulated Activity within the Proposed Scheme Boundary	Regulated Activity within the 250m Study Area 1
Type	No.	No.
Pollution Incident	3	12
Local Authority Pollution Prevention and Controls	0	8
Discharge Consents	3	34
Integrated Pollution Prevention And Control	0	1
Substantiated Pollution Incident Register	1	0

1 Defined as the area of land beyond the proposed scheme boundary but within the 250m study area

**Groundwater**

- 9.5.16. Superficial (alluvium, river terrace and glaciofluvial) deposits underlying the proposed scheme are each classified as Secondary 'A' aquifers, with the underlying bedrock including the Sidmouth Mudstone and Branscombe Mudstone Formations classified as Secondary 'B' aquifers.
- 9.5.17. The Arden Sandstone Formation bedrock is classed as a Secondary 'A' aquifer, with the exception of areas where it is recorded as mudstone only (e.g. the outcrop near the southern part of the proposed scheme in between Catherine De Barnes and the M42), where it is classed as Secondary 'B'.
- 9.5.18. The groundwater vulnerability zones around the area of the proposed scheme are mainly minor aquifer high [vulnerability] and minor aquifer low [vulnerability].
- 9.5.19. Borehole records collected from the various ground investigations historically undertaken during the development of the M42 motorway in the 1970s and 1980s recorded that groundwater was generally encountered within 10m of the ground surface adjacent to the M42 at Junction 6.
- 9.5.20. One groundwater abstraction license is located within the proposed scheme boundary with a further 10 licences located within the 500m study area, as detailed in Table 9.3.

**Table 9.3: Groundwater Abstractions**

License Holder	License Number	Type of Use	Location
Birmingham Corporation (Warren Farm)	03/28/11/0079	General Farming And Domestic	Within the proposed scheme, approximately 200m north of the M42 Junction 6 southbound off-slip road.
Mr W Lea (Common Farm)	03/28/11/0020	General Farming And Domestic	Approximately 115m east of the proposed scheme and approximately 350m west of Chester Road

Melbick Nurseries Limited	03/28/11/0081	Horticulture And Nurseries: General Use (Medium Loss) - DEEP WELL	Approximately 195m east of proposed scheme, off Chester Road (A452)
Melbick Nurseries Limited	03/28/11/0081	Horticulture And Nurseries: General Use (Medium Loss) - SHALLOW WELL	Approximately 195m east of proposed scheme, off Chester Road A452 (southbound)
Melbick Nurseries Limited -	03/28/11/0081	Horticulture And Nurseries: General Use (Medium Loss) - SHALLOW WELL	Approximately 200m east of proposed scheme, off Chester Road A452 (northbound)
Mr W Lea	03/28/11/0020	General Farming And Domestic	Approximately 200m east of proposed scheme, off Chester Road A452 (northbound)
Whale Tankers ltd	03/28/11/0131	Other Industrial/Commercial/Public Services: Process Water	Approximately 440m west of southern extent of the proposed scheme where the M42 crosses Henwood Lane
Mr W J Boddington	03/28/11/0065	General Farming And Domestic	Approximately 285m east of proposed scheme, off A446 westbound approach to A446/A452 interchange
Wyevale Garden Centres G&L Limited	Md/028/0011/006	Horticulture And Nurseries: Spray Irrigation - Direct	Approximately 310m east of proposed scheme off Chester Road A452 (southbound)
The Garden & Leisure Group Limited	Md/028/0011/006	Horticulture And Nurseries: Spray Irrigation - Direct	Approximately 310m east of proposed scheme off Chester Road A452 (southbound)
Mr C W Smith	03/28/12/0014	General Farming And Domestic	Approximately 460m north west of the northern extent of the proposed scheme. Approximately 200m west of the M42 Junction 7 off-slip road.

### Surface Water

9.5.21. Three main surface water bodies are associated with the proposed scheme (also refer to Chapter 13: Road Drainage and Water Environment). These comprise: Hollywell Brook (northern part of the proposed scheme, north of M42 Junction 6); River Blyth (far southern part of the proposed scheme); and Shadow Brook (central part of the proposed scheme, north of the B4102 Solihull Road and south of M42 Junction 6).

9.5.22. The Grand Union Canal, Low Brook, Pendigo Lake and Coleshill Pool are located within 250m of the proposed scheme in the south/ south west, central area, north and far north respectively. Several minor drains and small unlabelled ponds are also located within and surrounding the proposed scheme boundary.

9.5.23. The proposed scheme is located within a surface water Nitrate Vulnerable Zone, with much of the proposed scheme lying within a Surface Water Safeguard Zone.

9.5.24. One surface water abstraction is recorded approximately 390m east of the proposed scheme boundary, adjacent to Holywell Brook. This relates to a license held by Packington Estate Enterprises Limited listed as 'Mineral Products: Make-Up Or Top Up Water'.

### Receptor Importance or Sensitivity

9.5.25. A preliminary constraints plan depicting the locations of identified land contamination sources and water abstractions is presented in Figure 9.1.

9.5.26. Table 9.4 presents the importance or sensitivity of the identified geological and soils resources and receptors, in relation to their potential to be affected during the construction and operational phases of the proposed scheme.

**Table 9.4: Critical Receptors and Their Importance or Sensitivity**

Receptor	Phase		Importance or Sensitivity
	Construction	Operation	
Human Health – Off-site receptors	✓	✓	Medium
Human Health – Future site users	-	✓	Low
Controlled Waters – Groundwater	✓	✓	Medium
Controlled Waters – Surface Waters	✓	✓	Medium
Surrounding Land Uses – (Agricultural Land)	✓	-	Low to Medium
Soil Quality	✓	✓	Low to Medium
Sensitive Sites (including mining and mineral resources)	✓	✓	Medium
Property	✓	✓	Medium

## 9.6. Potential Impacts

### Construction Phase

9.6.1. In relation to potentially contaminative land uses, the following adverse impacts could potentially arise as a result of construction of the proposed scheme:

- Mobilising existing contamination in soil and groundwater as a result of ground disturbance and de-watering during construction;
- Increasing the potential for contaminants in unsaturated soils to leach to groundwater in open excavations during construction;
- Increasing the potential for contaminated surface run-off to migrate to surface water and groundwater receptors as a result of leaching from uncovered stockpiles;
- Introducing new sources of contamination, such as fuels, chemicals and oils used during construction activities;

- Increasing the potential of construction workforces (from handling, storage and exposure) to possibly unknown contaminants/ waste as a result of working through known historical landfills; and
  - Creating preferential pathways for the migration of soil contamination and gases, for example along new below ground service routes, service ducts and as a result of dewatering.
- 9.6.2. The preliminary assessment has concluded that such effects have the potential to affect human, ecological and controlled water receptors, and are likely to inform the continued design-development of the proposed scheme.
- 9.6.3. With regard to existing geological and soils resources, construction has the potential to result in the following adverse impacts:
- Degradation of soil resources from the compaction of soil due to heavy construction vehicle movement, changes in topography, exacerbation of erosion through the handling and storage of soils, or ground stability impacts;
  - The permanent loss of best and most versatile agricultural soils through landtake;
  - The generation of waste soils that cannot be reused elsewhere on the proposed scheme, requiring off-site disposal as waste; and
  - The sterilisation of mineral resources.
- 9.6.4. Some, albeit limited, potential exists for construction to result in beneficial impacts through the following:
- Creation of a new geological feature or attribute, for example through fresh exposure of a geological sequence in a road cutting;
  - Removal or treatment of contaminated soil, with the effect that existing adverse effects on receptors are removed; and
  - A reduction in soil erosion through improved drainage.

### **Operation Phase**

- 9.6.5. No potential adverse impacts are likely to result from the long term operation of the proposed scheme, other than the potential risk for controlled waters or geology and soils to be affected by from spillages arising from road accidents or faulty vehicles.
- 9.6.6. Should beneficial impacts be identified during the construction phase, it is expected that some of these could continue into the operational phase, for example the removal or treatment of contaminated soil would provide a benefit in future years.

## **9.7. Design, Mitigation and Enhancement Measures**

- 9.7.1. Mitigation is currently being considered as part of the design-development of the proposed scheme. This includes: the refinement of the alignment of the proposed scheme to avoid sensitive receptors (such as areas of higher grade soils and known areas of contamination); minimising temporary and permanent landtake requirements; developing a highway drainage system that includes pollution protection measures; and identifying specific measures to be implemented during both construction and maintenance activities.
- 9.7.2. Construction activities would be undertaken by the appointed contractor in accordance with industry best practice and in line with measures set out in the contractors CEMP, with emphasis placed on ensuring legal compliance and reducing risks to construction

workers. Measures for adoption and implementation are likely to include the following (and which would be included in the CEMP):

- Handling of topsoil and subsoil in a manner to retain their potential for plant growth including careful stripping, segregation and placement for reuse (where possible) as part of landscaping, earthworks or any areas of agricultural handback;
- The characterisation and disposal of waste soils as either Hazardous or Non-Hazardous waste;
- Minimisation of compaction of underlying soils from construction plant, and routine testing of soils during ground works to confirm material suitability for use;
- Groundwater level controls (as necessary);
- Adequate fuel/ chemical storage facilities e.g. bunded tanks, hard standing and associated emergency response/spillage control procedures;
- The use of well-maintained plant and associated emergency response/spillage control procedures;
- The implementation of an Asbestos Management Plan to ensure asbestos can be identified, removed and disposed of in a legally compliant manner; and
- The covered storage of contaminated material on sheeting to minimise the potential for leachate and run off from the stockpile being generated.

9.7.3. The prevention of pollution of controlled waters would be achieved via the mitigation measures presented in Chapter 13: Road Drainage and Water Environment.

#### **Operation Phase**

9.7.4. Potential risks posed to maintenance workers would be mitigated through adherence to appropriate site and task specific health and safety documentation.

9.7.5. It is expected that any spillages following road accidents would be routinely handled and managed by Highways England. Any potential operational effects on controlled waters during operation would be addressed via the mitigation measures presented in Chapter 13: Road Drainage and Water Environment.

### **9.8. Assessment of Effects**

9.8.1. The preliminary assessment indicates that, subject to the implementation of the above standard best practice mitigation measures, there is low likelihood for the proposed scheme to result in significant adverse effects with respect to geology and soils.

9.8.2. Ground investigations and ALC surveys will be undertaken to inform the assessment of effects and further develop measures to reduce effect significance as much as is reasonably practicable within the constraints of the proposed scheme and in accordance with applicable legislation. These surveys will involve the collection and analysis of soil and groundwater samples to establish the potential presence of any contaminants, taking into account historical land uses and proposed construction activities to reduce possible conflicts and the likelihood for disturbance.

## 10. MATERIALS

### 10.1. Introduction

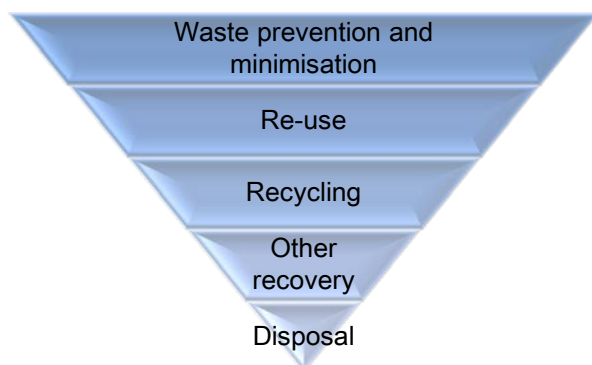
10.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on material resources and waste arising. The approach to the materials assessment and the methods being used to identify potentially significant effects are set out in the M42 Junction 6 Improvement Scheme EIA Scoping Report.

10.1.2. For the purpose of this PEI Report, materials are defined as comprising:

- The use of material resources; and
- The generation and management of waste.

10.1.3. The proposed scheme will aim to prioritise waste prevention, followed by preparing for re-use, recycling and recovery and lastly disposal to landfill as per the internationally recognised waste hierarchy (see Plate 10.1).

**Plate 10.1: Waste Hierarchy**



10.1.4. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of materials and waste effects associated with highway-based improvements.

### 10.2. Stakeholder Engagement

10.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and to develop the assessment scope.

10.2.2. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the materials assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- An assessment of the possible effects to human health from handling, storage and exposure to waste from historical landfills site will be undertaken as part of the ES.

10.2.3. Consultation will continue through the EIA process to: further refine the adopted study area (refer to Section 10.4); discuss the magnitude of predicted impacts and the significance of effects of materials usage and waste produced as part of the proposed scheme; and agree appropriate mitigation measures.

### 10.3. Assessment Assumptions and Limitations

10.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.

10.3.2. Data on waste generated by the proposed scheme and materials required to construct the proposed scheme are not currently available. This information will be generated as the proposed scheme design continues to develop.

### 10.4. Study Area

10.4.1. The study area for the materials assessment is derived by identifying the current capacity of the waste infrastructure and waste arisings in the waste disposal authority (SMBC), and in the wider West Midlands planning region.

### 10.5. Baseline Conditions

10.5.1. A review of relevant legislation, planning policy and guidance concerning the generation and management of waste and the principles of resource usage have been undertaken to date in the assessment to establish the baseline conditions that exist within the adopted study area.

10.5.2. The baseline waste conditions in terms of the locations of facilities and the existing quantities of waste generated is being established. The Solihull Local Plan (2013) identifies the following waste management sites (existing and potential) in the vicinity of the proposed scheme:

- Household waste recycling centre (HWRC) at Coventry Road, immediately to the east of the proposed scheme.

10.5.3. Solihull MBC's waste management strategy 2010 - 2020 provides a broad estimate of 180,000 tonnes per year of construction and demolition waste generated per year in the borough.

10.5.4. The EA's statistics on waste management in the West Midlands for 2015 (the latest year for which information is published) provides the information as presented in Table 10.1 and 10.2.

**Table 10.1: West Midlands: Landfill Inputs 2015 (000 tonnes)**

Landfill Type	Sub-Region						WEST MIDLANDS
	Herefs	Shrops	Staffs	Warks	West Mids Met	Worcs	
Hazardous Merchant	-	-	-	-	-	-	-
Hazardous Restricted	-	-	-	-	-	-	-
Non Hazardous with SNRHW* cell	-	324	133	1,032	322	60	1,871

Non Hazardous	-	68	492	16	213	260	1,049
Non Hazardous Restricted	-	-	24	-	-	-	24
Inert	-	40	603	995	233	34	1,904
Total	-	432	1,251	2,043	767	354	4,847

\* Some non-hazardous sites can accept some Stable Non Reactive Hazardous Wastes (SNRHW) into a dedicated cell, but this is usually a small part of the overall capacity of the site.

**Table 10.2: West Midlands: Landfill Capacity 2015 (000 m<sup>3</sup>)**

Landfill Type	Sub-Region						WEST MIDLANDS
	Herefs	Shrops	Staffs	Warks	West Mids Met	Worcs	
Hazardous Merchant	-	-	-	-	-	-	-
Hazardous Restricted	-	-	-	340	195	-	535
Non Hazardous with SNRHW cell*	-	2,045	2,547	4,961	1,437	750	11,740
Non Hazardous	-	870	8,185	5,761	13,633	4,659	33,107
Non Hazardous Restricted	-	106	-	-	-	-	106
Inert	-	1,032	3,957	5,483	1,842	2,894	15,207
Total	-	4,053	14,688	16,544	17,108	8,302	60,695

\* Some non-hazardous sites can accept some Stable Non-Reactive Hazardous Wastes (SNRHW) into a dedicated cell, but this is usually a small part of the overall capacity of the site.

## 10.6. Potential Impacts

10.6.1. A preliminary assessment of the type and magnitude of impact likely to arise during the construction and operational phases of the proposed scheme, and the significance of effect(s) (prior to mitigation measures) has been undertaken, in accordance with methodology and criteria presented in the EIA Scoping Report and based on current available information. However, at present there is insufficient information to estimate the quantities of waste that is likely to be generated, or the quantities of materials that are likely to be required to construct the proposed scheme.



### Construction Phase

10.6.2. For surplus materials and waste, the potential environmental effects are associated with the production, movement, transport, processing, and disposal of arisings from construction sites.

10.6.3. Table 10.3 summarises the types of materials used and wastes that may potentially be generated during proposed scheme construction.

**Table 10.3: Potential Material Use and Waste Arisings**

Project Activity	Material Use	Potential Waste Arisings
Site remediation / preparation / earthworks	Fill material for construction purposes Surplus excavated materials. Primary aggregates for ground stabilisation	Striped topsoil and subsoil. Potentially contaminated soils
Demolition	Materials are not required for demolition works	Waste arisings from the demolition of any existing buildings or structures
Site construction	Construction materials including: <ul style="list-style-type: none"> <li>• Concrete</li> <li>• Asphalt and bituminous material</li> <li>• Cement bound granular material</li> <li>• Well graded granular material</li> <li>• Precast concrete kerb</li> <li>• Timber</li> <li>• Plywood</li> <li>• Cementitious grout</li> <li>• Reinforcing steel</li> <li>• Reinforcing fabric</li> <li>• Geotextile</li> <li>• Geo-composite drainage system</li> <li>• Pipe bedding aggregate</li> <li>• Filter drain material</li> <li>• Packaging material</li> </ul>	<ul style="list-style-type: none"> <li>• Excess construction materials and broken/damaged construction materials</li> <li>• Existing highway infrastructure and technology as removed by excavation works</li> <li>• Waste oils from construction vehicles</li> <li>• Construction worker generated wastes</li> </ul>

10.6.4. For most highways schemes, the largest quantities of waste and materials are generally those associated with earthworks, especially in those cases where a balance between excavation (“cut”) and material placement (“fill”) cannot be achieved.

10.6.5. The proposed scheme design is currently being progressed to optimise the requirements of cut and fill and where possible this will be minimised to reduce the import and export and materials and waste. The project design team aim is to achieve a cut-fill balance, if practicable.

### Operation Phase

10.6.6. As per the EIA Scoping Report, operational phase waste and materials impacts have been scoped out of the preliminary design stage assessment and will not be considered further.

## **10.7. Design, Mitigation and Enhancement Measures**

### **Construction Phase**

10.7.1. Mitigation is currently being considered as part of the design-development of the proposed scheme. This includes:

- Waste arisings will be prevented and designed out where possible;
- Opportunities to re-use material resources would be sought where practicable;
- Where re-use and prevention are not possible, waste arisings would be managed in line with the waste hierarchy; and
- A Site Waste Management Plan would be developed and implemented as part of the construction contractors CEMP.

## **10.8. Assessment of Effects**

10.8.1. Further work will be undertaken as part of the assessment to develop, refine and agree mitigation measures for materials and waste. Once established and agreed with relevant statutory bodies, an assessment will be made of the role such measures would have in mitigating effects to reduce their significance.

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## 11. NOISE AND VIBRATION

### 11.1. Introduction

11.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on noise and vibration. Receptors that are sensitive to noise (Noise Sensitive Receptors - NSRs) are predominantly residential properties, but also includes educational buildings, hospitals and places of worship.

11.1.2. The approach to the assessment and the methods being used to identify potentially significant noise and vibration effects are set out in the M42 Junction 6 Improvement Scheme EIA Scoping Report. In summary, the process of scoping identified that the construction and/ or operation of the proposed scheme could result in the following:

- Noise and vibration associated with construction related activities;
- Noise and vibration associated with construction traffic; and
- Noise and vibration due to road traffic during the construction and operational phases of the proposed scheme.

11.1.3. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of noise and vibration effects associated with highway-based improvements.

### 11.2. Stakeholder Engagement

11.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and records concerning noise within the defined study area, and to develop the assessment scope.

11.2.2. The Environmental Health Officer (EHO) at SMBC has been consulted to confirm:

- If there are any known sources of complaint (noise and/or vibration), either from traffic or other environmental sources;
- If there are any polices relating to temporary or permanent noise sources;
- The identification of particularly sensitive receptors; and
- If there are any previous noise studies in the area.

11.2.3. A response to the questions above is awaited. Further consultation will be undertaken with the EHO at SMBC to discuss proposed noise monitoring locations and durations, and assessment criteria.

11.2.4. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the noise and vibration assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- The noise assessment should include the potential impacts to the users of the Grand Union Canal both during construction and operation.

### 11.3. Assessment Assumptions and Limitations

11.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.

11.3.2. At this stage, only preliminary traffic data have been available, therefore a full detailed noise and vibration assessment has not yet been undertaken. Once the detailed

construction or operational traffic flow data are available, noise models will be created and the detailed assessment undertaken (to be reported in the ES).

- 11.3.3. The operational phase traffic noise assessment contained within this chapter uses the available preliminary traffic data to calculate the Basic Noise Levels (BNL) (using the Calculation of Road Traffic Noise calculation method (CRTN))<sup>30</sup> along the proposed scheme and the surrounding road network. A short term and long term noise level change has then been predicted for each road link, but these changes at source do not necessarily relate to actual change in noise levels at the selected NSRs; rather the change in road traffic noise level at each NSR results from the combination of noise contributions from different road traffic sources.
- 11.3.4. The preliminary traffic data were provided as average hourly flows, which have been multiplied by 18 to get the 18hr Average Annual Weekday Traffic (AAWT) flows. The traffic data includes committed developments in both the Do-Minimum (no proposed scheme) and Do-Something (with proposed scheme) scenarios in order that the changes in traffic flow represents the effects of the proposed scheme in isolation.
- 11.3.5. In order to quantify the likely noise and vibration impacts from construction works, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated construction works programme. At this stage details regarding construction activities and plant requirements/programme are not available. Therefore, an initial high level qualitative assessment of potential construction noise and vibration impacts has been undertaken and reported herein, based on anticipated key construction activities and knowledge of other major road schemes.
- 11.3.6. Given the above, the findings of the preliminary assessment as reported herein may be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further research and investigative surveys are undertaken to fully understand its potential effects.

#### **11.4. Study Area**

- 11.4.1. The study area for the assessment of construction phase noise impacts comprises the closest identified potentially sensitive receptors to the proposed scheme and any other areas affected by construction (such as construction compounds, soil storage areas, haulage routes etc.). The construction study will be confirmed in the ES, however the area will be sufficiently broad to capture representative NSRs in different geographic areas that could potentially be significantly affected during the construction phase.
- 11.4.2. For the purpose of the detailed level operational phase assessment to be included in the ES, the main study area for operational noise will extend 1km from existing routes that would be improved or bypassed, and any proposed new routes, between the start and end points of the physical works associated with the proposed scheme. At this stage, potential changes in traffic noise levels have been considered within the 1km boundary, with a particular focus on properties close to the proposed scheme and other "affected routes". However, within this 1km boundary, a 600m calculation area will be subject to traffic noise modelling and reported in the ES. Outside this 1km boundary, a 50m boundary around identified "affected routes" will be considered.
- 11.4.3. The calculation area for the modelling of noise impacts to be reported within the ES comprises a corridor 600m either side of the proposed scheme, 600m either side of the

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<sup>30</sup> The CRTN defines the procedures for calculating noise from road traffic

extent of the local road network to be realigned as part by the proposed scheme (i.e. the B4438 Catherine De Barnes Lane), and a set of corridors 600m either side of all affected routes within 1km of the proposed scheme.

- 11.4.4. For dwellings and other sensitive receptors that are within the 1km boundary, but more than 600m from an affected route or the proposed scheme, a qualitative assessment of the traffic noise impacts will be carried out.
- 11.4.5. For affected routes outside the 1km boundary, an assessment will be undertaken by estimating the CRTN BNL for these routes with and without the proposed scheme. A count of the number of dwellings and other sensitive receptors within 50m of these routes will be undertaken.
- 11.4.6. Figure 11.1 shows the 1km study area boundary and identified affected links in three different assessment years and scenarios.
- 11.4.7. The operational traffic vibration annoyance study area is defined as 40m from the edge of the proposed scheme carriageway.

### 11.5. Baseline Conditions

- 11.5.1. The baseline (existing) noise environment is dominated by a mix of road and aircraft traffic, with some localised commercial and industrial sources. Currently no baseline noise measurement data have been obtained for the area in the vicinity of the proposed scheme.
- 11.5.2. In the absence of available noise data, baseline noise surveys will be undertaken. The preliminary traffic data has been reviewed to identify areas that are predicted to potentially result in the greatest noise level changes. Based on this review, up to seven noise monitoring locations (which are representative of NSRs along the proposed scheme alignment) have been identified. These locations and noise monitoring methods/ durations will be defined following discussions with the EHO at SMBC and Highways England.
- 11.5.3. It is proposed to undertake long-term baseline noise monitoring at each selected location to include weekend and weekdays times. Ideally, and subject to adequate security, a minimum five day unmanned monitoring period is preferred (Thursday – Monday). However, this will be subject to the identification of suitable and secure locations/permissions from local residents for access to gardens for noise monitoring equipment. If the proposed locations are not secure, this may not be possible and a shortened, manned monitoring regime may be appropriate. The results from the noise survey will be used to calibrate the noise model and for the construction phase noise assessment. Baseline traffic vibration predictions and surveys are not proposed.
- 11.5.4. Table 11.1 details the currently identified NSRs (and their sensitivities) within the 1km boundary of the proposed scheme as identified from an initial desk-based review of the area using Ordnance Survey MasterMaps® and aerial photography, and Natural England’s website (<http://www.naturalengland.org.uk/>).

**Table 11.1: Description of Local NSRs**

Road/ NSR Name	Additional Information	Approximate Location	Sensitivity*
Bickenhill	A village with residential buildings,	Adjacent to the new bypass	High

	a church, a caravan park and guest houses		
Shadowbrook Lane	Residential	To the east within 100m of the new bypass	High
Catherine De Barnes Lane (B4438)	Residential	50m west of the new bypass	High
Four Winds	Residential	30m west of the new bypass	High
Walford Hall Farm	Residential	250m south-west of the new bypass	High
Woodhouse Farm	Residential; contains Solihull Music School	900m west of the new bypass	High
Hampton Lane Farm	Residential	300m south-west of the new bypass	High
Catherine De Barnes	A village with residential buildings on Bickenhill Lane and Hampton Lane	400 - 1,000m south-west of the new bypass	High
Solihull Road (B4102)	Residential	80m east of the M42 junction with the new bypass	High
Shadowbrook Lane	Residential	200 - 400m east of M42	High
Hampton in Arden	A village with residential properties	900 - 1,000m east of M42	High
Old Station Road	Residential	20 - 1,000m east of M42	High
Middle Bickenhill Lane	Residential	300 - 400m north-east of new slip roads of M42 J6	High
Pendingo Way, Ambassador Road	Airport hotels: Hilton, Crowne Plaza, Novotel, ibis, and Arden	50 - 900m north of A45	High
The National Motorcycle Museum		Adjacent to M42 Junction 6	Medium
The Grand Union Canal	Waterway connecting Birmingham and London amongst others	Approximately 600m south west of the proposed scheme	High

National Exhibition Centre	Multi-purpose conference centre, including concerts	Approximately 250m west of M42	Medium to very high (depending upon prevailing use)
*Sensitivity of the receptors have been derived from the criteria defined within the EIA scoping report			

11.5.5. Ecological receptors also have the potential to be impacted by noise. As indicated in Chapter 8: Nature Conservation, there are no nationally designated ecological sites (related to fauna) within the 1km boundary around the proposed scheme. However, there are a number of ecologically sensitive areas in the vicinity of the proposed scheme – as such a number of ecological receptors will be selected in conjunction with the proposed scheme ecologists and Natural England. Changes to traffic noise levels as a result of the operational noise assessment will feed into the ecological impact assessment to be reported in the ES.

11.5.6. There are several Noise Important Areas (NIAs) within the 1km boundary of the proposed scheme - these are detailed in Table 11.2.

**Table 11.2: Description of NIAs**

NIA code	Location	Responsible Authority
7482	Adjacent to M42	Highways England
7481	Adjacent to M42 Junction 6	Highways England
7483*	M42 near J6	Highways England
2831	Adjacent to A45	SMBC
2830	A45 near Elmdon	SMBC*

\* Adjacent to 1km boundary

11.5.7. SMBC is the relevant local highway authority for the NIAs that are not on the M42. Information regarding any current proposals for noise mitigation at these NIAs will be sought from Highways England and SMBC (as applicable) and presented in the ES. Further assessment taking into account the potential impact of the proposed scheme on these NIAs will be undertaken where necessary and reported in the ES.

## 11.6. Potential Impacts

### Construction Phase

11.6.1. The proposed scheme construction works are likely to be divided into a number of ground preparation and construction phases. It is assumed at this stage that the works would take place during day, evening and night time periods. Heath End House is located at the junction between the B4438 and Shadowbrook Lane, however, as this property would be demolished to facilitate the proposed scheme it has not been considered in the assessment.

11.6.2. The nearest residential properties are located along the B4438 Catherine De Barnes Lane, Shadowbrook Lane (near the junction with B4438 Catherine De Barnes Lane), St Peter's Lane (near the junction with B4438 Catherine De Barnes Lane), Clock Lane, Middle Bickenhill Lane (near M42 Junction 6) and B4102 Solihull Road near M42.

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- 11.6.3. In order to evaluate noise levels during the construction phase, it is necessary to have knowledge of the various activities that will be undertaken. However, as the proposed construction contractor has not been appointed, detailed information regarding the construction programme and methods of working are not available. Thus the consideration of construction noise herein is necessarily qualitative.
- 11.6.4. It is not unreasonable to assume at this stage that, without mitigation measures in place, construction noise levels may result in temporary, short term moderate to major adverse impacts at the worst affected residential NSRs close to the proposed works during the noisier construction operations. This is on the basis of the proximity of NSRs and given that the proposed construction works would potentially be required during the evening and at night.
- 11.6.5. In practice, construction noise levels and resulting impacts are likely to vary during the different construction phases of the proposed scheme depending upon the location of work sites and proximity to NSRs. Furthermore, specific mitigation measures would assist in minimising construction noise impacts (refer to Section 11.7).
- 11.6.6. A detailed assessment of the impacts due to construction activities will be undertaken and included in the ES using advice from a construction contractor - the assessment will also consider construction traffic and potential changes in road traffic noise during the construction phase due to road closures, diversion, management.

#### **Construction Vibration**

- 11.6.7. Concern is often expressed by local residents that vibration from construction activities will cause structural damage to their properties. However, it has been shown that vibrations experienced indoors that cause anxiety are often smaller than would be needed to cause structural damage.
- 11.6.8. The level of impact at different receptors is dependent upon a number of factors, including the distance between construction works and receptors, ground conditions, the nature and method of works required close to receptors, and the specific activities being undertaken at any given time. However, given the close proximity of the nearest residential receptors to the proposed scheme construction works, there is the potential for some vibration impacts. Whilst it is considered very unlikely that typical road construction working routines would generate levels of vibration above which building damage would be expected to be sustained (subject to final plant and working requirements), there is the potential that vibration impacts could cause annoyance to building occupants and lead to potentially moderate adverse impacts.
- 11.6.9. Where heavy earthworks, vibratory rollers or other significant vibration producing operations are proposed in close proximity to existing buildings, further consideration should be given to potential impacts during the EIA and reported in the ES using construction advice from a construction advisor. Potential vibration mitigation measures are discussed in Section 11.7.

#### **Operation Phase**

- 11.6.10. Operation of the proposed scheme has the potential to result in both beneficial and adverse permanent traffic noise impacts at NSRs. The introduction of new roads would introduce a new noise source to the area, and would have the potential to result in increases in traffic noise levels. The magnitude to the operational traffic impact at a receptor is dependent on a range of factors, including traffic flow, composition and



speed, the road surfacing, ground topography and the presence of intervening buildings/ structures and the distance to the road.

- 11.6.11. At this stage, the detailed traffic data for the proposed scheme is not yet available, therefore, noise modelling has not yet been undertaken to predict noise levels at NSRs within the calculation area. Such modelling work will be completed and reported in the ES. However, preliminary traffic data are available for the Do-Minimum and Do-Something scenarios in the Baseline Year (opening year 2023) and Future Year (2038) in the Do-minimum (without proposed scheme) and Do-something (with proposed scheme) scenarios. Herein the CRTN BNL for each link has been used to calculate the potential change in noise at the source, but these changes do not necessarily relate to actual changes in noise levels at NSRs. Rather the change in road traffic noise level at each NSR would result from the combination of noise contributions from different road traffic sources.
- 11.6.12. Nevertheless, the BNL results can be used to give an indication of where potential adverse and beneficial noise levels changes may occur during proposed scheme operation. Figure 11.2 shows the road links which are predicted to have at least 1dB noise level change in the short-term (Do-minimum 2023 vs Do-something 2023), whilst Figure 11.3 shows the roads links which are predicted to have at least 3dB change in the long-term (Do-minimum 2023 vs Do-something 2038).
- 11.6.13. Figure 11.2 indicates that there would be a potential decrease in noise along Catherine De Barnes Lane, however, the proposed scheme would introduce a new noise source adjacent to Catherine De Barnes Lane. There would be both an increase and decrease in noise levels on links at the M42 Junction 6 and the junction of A45 and B4438.
- 11.6.14. Figure 11.3 indicates that in the long term, there would also be affected routes with a 3dB change in noise levels outside the 1km boundary. Once the detailed traffic data are available, the noise levels along such affected routes will be reviewed and reported in the ES.
- 11.6.15. Based on the preliminary traffic assessment as shown in Figures 11.2 and 11.3, a review of the proposed scheme alignment and professional judgment, it is apparent that there is the potential for moderate/ major adverse impacts at the most affected properties on St Peter's Lane in Bickenhill, Four Winds Farm, Solihull Road near junction with M42 and Old Station Road (without mitigation). There is the potential for minor to moderate adverse impacts at Walford Hall Farm, Hampton Lane Farm, the hotels on Pendingo Way, and along Middle Bickenhill Lane (without mitigation).
- 11.6.16. There are also some non-scheme roads (related to HS2) which may be built out by the future year. Figure 11.3 shows the non-scheme roads which would have at least 1dB noise level change in the short term in the future year by comparing the Do-Minimum 2038 vs Do-Something 2038 traffic flows. The future year Do-minimum vs Do-something comparison provides an indication of potential noise effects. The nearest NSR is the Holiday Inn Express NEC hotel to the northwest, which may experience minor adverse noise impacts.

### **Operational Traffic Vibration**

- 11.6.17. Vibration from traffic can be transmitted through the air or through the ground. Airborne vibration is produced by the engines and exhausts of road vehicles, with dominant frequencies typically in the range of 50 - 100 Hz. Ground-borne vibration is produced by the interaction of vehicle tyres and the road surface with dominant frequencies

typically in the range of 8 - 20 Hz. The passage of vehicles over irregularities in the road surface can also be a source of ground-borne vibration.

- 11.6.18. Traffic vibration can potentially affect buildings and disturb occupiers. DMRB reports that extensive research on a wide range of buildings has found no evidence of traffic induced ground-borne vibration being a source of significant damage to buildings and no evidence that exposure to airborne vibration has caused even minor damage.
- 11.6.19. DMRB advises that ground-borne vibration should not be a problem adjacent to smooth and well maintained road surfaces free of discontinuities and potholes. It is a requirement of new highway constructions that the highway surface be smooth and free from any discontinuities. Paragraph A5.26 of DMRB HD213/11 states, in relation to ground-borne vibration: "*Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances*". Therefore, on proposed scheme opening, ground-borne vibration is not anticipated to be a significant issue.
- 11.6.20. Airborne vibration is noticed by occupiers more often than ground-borne vibration, as it may result in detectable vibrations in building elements such as windows and doors. DMRB states that perceptible vibration only occurs in rare cases and identifies that the normal use of a building, such as closing doors and operating domestic appliances, can generate similar levels of vibration to that from traffic in most circumstances. The potential for vibration impacts due to traffic is limited to the immediate vicinity of a road, and the relationship between annoyance due to vibration and traffic noise level is based on properties located within 40m of a road.
- 11.6.21. The initial review of NSRs has indicated that there are some properties on B4438 Catherine De Barnes Lane, St Peters Lane, Shadowbrook Lane and B4102 Solihull Road within 40m of the proposed scheme. The potential for a change in traffic vibration annoyance at properties within 40m of the proposed scheme will be assessed and reported in the ES, given that this assessment is linked to the outputs from the detailed noise modelling.

## **11.7. Design, Mitigation and Enhancement Measures**

- 11.7.1. Environmental considerations have been taken into account during the development of the proposed scheme design, in order to reduce and/or avoid potential noise and vibration impacts. This iterative approach has led to a range of mitigation measures capable of reducing the magnitude of impacts being embedded within the proposed scheme design or captured within the proposed construction practices.

### **Construction Phase**

- 11.7.2. The preferred approach for controlling construction noise and vibration is to reduce levels at source where possible, but with due regard to practicality. Sometimes a greater noise level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.
- 11.7.3. During the proposed scheme construction phase, Section 11.6 indicates that there is the potential for adverse noise impacts. The appointed construction contractor would undertake the works in line with measures as set out within their CEMP – this would include a range of noise and vibration mitigation measures such as the following:

- Ensure all processes are in place to minimise noise before works begin and ensure best practicable means are being achieved throughout the construction programme;
- Ensure that modern plant is used, complying with the latest EC noise emission requirements;
- Selection of inherently low noise and vibration plant and equipment where possible;
- Review of construction programme and methodology to consider low noise/ low vibration methods (including non-vibratory compaction plant and low vibration piling methods, where required);
- Hydraulic techniques for breaking to be used in preference to percussive techniques where practical;
- Plant and equipment to be used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use;
- Contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) which should form a prerequisite of their appointment;
- Loading and unloading of vehicles, dismantling of site equipment or moving equipment or materials around the application site to be conducted in such a manner as to minimise noise generation and where practical to be conducted away from NSRs;
- Appropriate selection of equipment;
- Optimal location of equipment on site to minimise noise disturbance;
- Provision of acoustic enclosures to static plant, where necessary;
- Use of less intrusive alarms, such as broadband vehicle reversing warnings; and
- Local screening of equipment and employment of perimeter hoarding where possible.

11.7.4. During the proposed scheme construction phase, appropriate mechanisms to communicate with local residents would be set up to highlight potential periods of disruption (e.g. web-based, newsletters, newspapers, radio announcements etc.). An information web-page would be provided and kept up-to-date on the Highways England website to reflect construction and community liaison requirements. It is envisaged that the web-page would provide up-to-date information on the progress of the construction works, areas affected by construction, mitigation in place to reduce adverse effects, information regarding planned construction works (including any proposed works outside normal hours) and works recently completed. The communication strategy would minimise the likelihood of complaints. Residents would be provided with a point of contact for any queries or complaints.

#### **Operation Phase**

11.7.5. Noise mitigation measures will be considered where traffic noise predictions show that there would be potential significant effects on receptors. Mitigation measures that could be considered to reduce the impact of traffic noise on local NSRs, if required, include:

- Earth bunds/ noise barriers to screen nearby NSRs - where there is sufficient land available, earth bunds/noise barriers can be designed in collaboration with the landscape design to help integrate the route of new/realigned sections of road into the surrounding area. This can also provide visual mitigation;

- Low noise surfacing - if traffic speeds are sufficient for a low noise surface to be effective. Current DMRB guidance advises that a noise benefit from a low noise surface should only be assumed at speeds of 75km/hr or more although in reality, there is not a sharp cut off in the effectiveness of low noise surfacing at 75km/hr and some benefit is likely to be realised at lower speeds; and
- Noise insulation of individual properties to protect the internal noise environment.

11.7.6. Areas where additional noise mitigation (e.g. noise barriers or earth bunds) is required will be identified and presented in the ES once the operational noise modelling and assessment has been completed.

## **11.8. Assessment of Effects**

### **Construction Phase**

11.8.1. As with most construction works, there would likely be some temporary impacts on local receptors during the proposed scheme construction phase. The nearest residential properties to proposed construction activities are located along the B4438 Catherine De Barnes Lane, Shadowbrook Lane (near the junction with B4438 Catherine De Barnes Lane), St Peter's Lane (near the junction with B4438 Catherine De Barnes Lane), Clock Lane, Middle Bickenhill Lane (near M42 Junction 6) and B4102 Solihull Road near M42.

11.8.2. Although a quantitative assessment of construction noise and vibration impacts has not yet been undertaken, without mitigation measures in place, the moderate to major impacts identified in Section 11.6 would lead to short term significant adverse effects at the worst affected residential NSRs. However, following the implementation of appropriate mitigation measures, including adoption of best practicable means via implementation of the CEMP, temporary noise effects would be reduced. The level of residual effects will be assessed and reported in the ES, taking into account the advice of a construction contractor.

### **Operation Phase**

11.8.3. Operation of the proposed scheme has the potential to result in both beneficial and adverse permanent traffic noise impacts. The introduction of new roads would introduce new noise sources to the area, which would have the potential to result in moderate/ major adverse impacts at the closest most affected NSRs on St Peter's Lane in Bickenhill, Four Winds Farm, Solihull Road near junction with M42 and Old Station Road (without mitigation). This would result in potential moderate/ large adverse effects.

11.8.4. The requirement for specific additional noise mitigation will be defined following noise modelling using the detailed traffic data. Such measures might include barriers or earth bunds to reduce noise levels along the proposed route near to NSRs, together with the use of a low noise surface. With appropriately designed acoustic screening, it would be envisaged that the potential significance of noise effects could potentially be reduced to minor/ moderate adverse. However, this will be confirmed through detailed noise modelling which will be reported in the ES.

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## 12. PEOPLE AND COMMUNITIES

### 12.1. Introduction

12.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on people and communities, which considers the following components:

- Non-motorised user (NMF) routes, journey patterns and amenity (i.e. those made by pedestrians, cyclists and equestrians);
- Traveller's views of the road and driver stress; and
- Community and private assets.

12.1.2. The approach to the assessment and the methods being used to identify potentially significant effects on people and communities are set out in the M42 Junction 6 Improvement Scheme EIA Scoping Report. In summary, the process of scoping identified that the construction and/or operation of the proposed scheme could result in the following:

- Effects on the journeys made on foot, bicycle or horseback, including journeys that use public rights of way (PRoW) as well as roads.
- Effects on the amount of stress experienced by drivers.
- Effects on the type of views and outlook available to travellers from the road.
- Effects on communities in relation to severance from facilities they use or visit, and the loss of land used by people for recreation.
- Effects on private and commercial property through demolition of buildings and landtake within their curtilage.
- Effects on development land and land-based designations resulting from landtake.
- Effects on agricultural land arising from landtake, which can affect the viability of the businesses.

12.1.3. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of effects on people and communities associated with highway-based improvements.

### 12.2. Stakeholder Engagement

12.2.1. Consultation will be undertaken with SMBC to: confirm the adopted study areas (described below); obtain any further information and/ or records relevant to the assessment (such as confirming planning applications in the area); and agree appropriate mitigation measures to address identified impacts and effects.

12.2.2. Discussions will be held with affected private, commercial and agricultural landowners and groups that own community land and/or facilities to fully establish the potential effects of the proposed scheme on their interests and the viability of future use, and to inform the design-development of the proposed scheme. These will involve the following:

- Undertaking NMF surveys to establish the level of current usage on PRoWs and roads potentially affected by the proposed scheme. These will also identify user types and the patterns of journeys they make.
- Undertaking agricultural surveys with landowners and their agents to establish the type and use of agricultural land potentially affected by the proposed scheme.

These will examine and confirm current (and planned) land management, ownership/tenancy arrangements, farm accessibility, drainage regimes and holding size.

- Undertaking soil sampling to determine ALC grades (to be undertaken as part of the geology and soils assessment – see Chapter 9).

12.2.3. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the people and communities assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- The assessment should consider the changes to NMUs as a result of traffic conditions / disruption during the construction and operation period; and
- The assessment should include the potential impacts to equestrians as result of the proposed scheme.

### **12.3. Assessment Assumptions and Limitations**

12.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.

12.3.2. Assumptions have been made using a combination of available information and professional judgement to establish current land use(s) and the viability of existing commercial and agricultural businesses and enterprises. Community interests have been identified through desk-based reviews. Accordingly, there is potential that not all interests potentially affected by the proposed scheme have been identified at this stage of the assessment process.

12.3.3. The findings of the preliminary assessments may thus be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further research and investigative surveys are undertaken to fully understand the proposed scheme's potential effects.

### **12.4. Study Area**

12.4.1. The process of scoping identified the following study area extents:

- For effects on NMUs, a study area of 500m beyond the proposed scheme has been adopted in order to capture all relevant routes (i.e. designated and undesignated routes and trails, PRoW recorded on SMBC's definitive map, and roads and crossings used by NMUs).
- For effects on vehicle travellers, a study area focusing on users of the M42, adjacent roads linked to the M42, and the proposed new sections of carriageway (the proposed scheme) has been adopted.
- For effects on community and private assets, a study area comprising all land within the proposed scheme boundary and outward to 250m has been adopted in the examination of effects on private property demolition, loss of land used by the community, effects on development land and land designations, community facilities, agricultural land and individual farm units.

12.4.2. The study areas as defined above will be further refined with the relevant statutory consultees.

## 12.5. Baseline Conditions

12.5.1. The following tasks have been undertaken to date in the assessment to establish the baseline conditions (which where relevant have been presented on Figure 12.1), that exist within the adopted study areas:

- A review of relevant legislation, planning policy and guidance concerning: the protection of best and most versatile agricultural land; the role of strategic highways proposals in promoting safe and sustainable travel for pedestrians and cyclists; the need to consider the status and accessibility of PRoW; the obligation to replace any areas of community land lost through development; and the need to provide continued access to affected private and commercial properties.
- Desk-based review of the relationship between the proposed scheme and residential, commercial, agricultural land/buildings and land/routes used by the community. This has been identified through review of Ordnance Survey mapping, aerial photography, SMBC's definitive map, the MAGIC website and other web-based information sources.
- A review of the current levels of traffic use on local and strategic routes associated with the proposed scheme.
- A review of published studies undertaken to inform route optioneering and selection at PCF Stage 2.

### NMU Routes

12.5.2. The desk-based review has established that the local area contains a network of PRoW and local roads which are likely to be used by people for recreational enjoyment and for travelling between local communities. The following PRoW have been identified within the 500m study area:

- **PRoW M107:** This PRoW is located within 500m of Junction 6 and crosses the study area in a west to east direction, commencing on Church Lane and eastwards through open fields and over the Birmingham to London Euston Midlands railway line on an overbridge which at its closest passes approximately 30m from the southern extent of the junction (M42/ A45 westbound on-slip). Beyond the railway line, the PRoW deviates northwards and runs in parallel to the wider M42 corridor for approximately 40m before stopping at Junction 6. The PRoW continues to the east of the junction and commences off Old Station Road passing behind the existing National Motorcycle museum. The PRoW continues behind the museum for approximately 300m before separating in a southerly and northerly direction and out of the study area.
- **PRoW M106:** This PRoW is located approximately 30m south of the existing Clock Interchange at its nearest point. The PRoW travels in a south to north direction, commencing from Church Street in Bickenhill for approximately 350m before stopping to the immediate east of Catherine De Barnes Lane B4438.
- **PRoW M123:** A PRoW commences at Hampton Lane Farm and travels north for approximately 450m before being intersected by M122 at which point M123 continues north through the field network before stopping to the immediate west of Heath Farm on Shadowbrook Lane.

- **PRoW M122:** The PRoW travels in a west to east direction, to the east it runs to the boundary of the M42 and turning north to end on Shadowbrook Lane, and to the west the PRoW passes south of Shadowbrook Meadows Nature Reserve and ends at Catherine De Barnes Lane.
- **PRoW M110:** The PRoW commences off Church Lane to the immediate south of St Peter's Church and continues south for approximately 100m before joining and stopping at St Peter's Lane.
- **PRoW M111:** The PRoW commences off the southern extent of St Peter's Lane and through fields and continues southwards away Bickenhill for approximately 800m where it crosses the M42 on a pedestrian overbridge. Beyond the M42, the PRoW continues south, past Home Farm and out of the study area.
- **PRoW M113a:** The PRoW commences off M113 approximately 300m to the west of Catherine De Barnes Lane behind the existing GAA. The PRoW travels southwards for approximately 480m to Four Winds Farm before turning eastwards and joining the B4438 Catherine De Barnes Lane.
- **PRoW M113:** A PRoW commences immediately north of Four Winds Farm and travels in a north westerly direction away from Catherine De Barnes Lane through open fields in a westerly direction towards Castle Hill and out of the study area.
- **PRoW M112:** A PRoW passes in an east to west direction to the south of the village of Bickenhill, commencing on St Peter's Lane and through to Catherine De Barnes Lane, at which point the PRoW continues westwards through field networks and to the immediate north of a Radio Beacon and out of the study area.
- **PRoW M109:** Further north a PRoW crosses the study area in a west to east direction, entering the study area to the west of the caravan site off Catherine De Barnes Lane, it follows the route of a path between field boundaries to Catherine De Barnes Lane and in to the west of Bickenhill on to St Peter's Lane.
- **PRoW M106:** A PRoW commences approximately 30m south of the existing Catherine De Barnes Lane (B4438). The PRoW travels in a south to north direction, commencing from Church Street in Bickenhill for approximately 350m before stopping to the immediate east of Catherine De Barnes Lane B4438.
- **PRoW M107:** A PRoW commences on Church Lane and travels eastwards through open fields and over the Birmingham to London Euston Midlands railway line on an overbridge. Beyond the railway line, the PRoW deviates northwards and runs in parallel to the wider M42 corridor for approximately 40m before stopping at Junction 6. To the east of the junction, the PRoW continues off Old Station Road towards the existing National Motorcycle Museum and out of the study area.

12.5.3. Sections of the "Green Man Trail" are also located within the 500m study area. This is a 21 mile undesignated walking trail formed primarily by routes within the PRoW network. The trail is promoted by SMBC for educational and travel purposes, and passes through urban and rural communities including Bickenhill and Hampton in Arden.

12.5.4. There are no bridleways within the 500m study area surrounding the proposed scheme. There are however three known equestrian facilities within the study area within Bickenhill, a private equestrian paddock off St Peters Lane and off Church Lane and a larger livery at Hazel Farm to the south of the village.



12.5.5. A designated traffic-free cycle lane is present along the length of the B4438 Catherine De Barnes Lane. There are no Sustrans National Cycle Routes within the study area.

### Road Network

12.5.6. The road network surrounding the proposed scheme is principally formed by the following motorways and A-classification roads:

- **M42 Motorway:** A three lane dual carriageway running in a north-easterly direction from Worcestershire to Leicestershire, with a speed limit of 70mph.
- **M6 Motorway:** A three-lane dual carriageway running in a north/south direction connecting to the M54 and the M6 Toll within the study area, with a speed limit of 70mph.
- **M6 Toll Motorway:** A three-lane dual carriageway which runs between M6 Junction 11A and the M6 Junction 3A, with a speed limit of 70mph.
- **A45:** A two-lane dual carriageway road which runs in an east/west direction connecting Coventry to Birmingham, with a speed limit of 50mph.

12.5.7. A review of the current conditions on the motorway and A-classification routes indicates that although directional signage meets the required standard for motorways and trunk roads, drivers are exposed to frustration and fear of accidents. This is attributed to long delays and frequent congestion on the M42 which causes slow moving traffic and frequent stop-start conditions, particularly on junction approaches, resulting in driver impatience and/or hesitancy. These conditions are exacerbated by the large number of HGVs and vulnerable or inexperienced road users making journeys on the network. Existing levels of driver stress on the M42 and M6 motorways, and the A-classification routes, are accordingly considered to be high.

12.5.8. Other important road network routes include the B4438 which connects to the A45 at the Clock Interchange and runs through Bickenhill, and the B4102 which connects Catherine De Barnes and Hampton in Arden. These routes are used more by local traffic travelling between communities.

12.5.9. The visual outlook afforded to vehicles travelling on the M42 is one that is generally restricted by a combination of established tree and shrub planting and motorway infrastructure. This planting frames both the southbound and northbound carriageways, and offers very few opportunities for drivers to experience more far reaching views beyond the road.

12.5.10. A similar composition of view is experienced at the Clock Interchange, where established lines of trees contain the junction and slip roads. To the immediate south, the elevated Catherine De Barnes Lane (B4438) slip road to Airport Way screens and filters longer distance views towards the rural landscapes surrounding Bickenhill.

12.5.11. Views from Catherine De Barnes Lane (B4438) are contained in the majority of places by dense lines of trees along both sides of the road. As the B4438 passes north of Bickenhill, the planting reduces and the outlook from the road opens up to offer vehicle travellers view of the surrounding agricultural landscape.

12.5.12. The local road network within the study area will be used by NMUs as part of wider journeys between their homes and community facilities. Users currently experience different levels of severance as part of journeys made between the homes and community facilities caused by traffic forming a barrier to movements.

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### **Private Property**

- 12.5.13. Residential properties are located on Shadowbrook Lane, St Peter's Lane (north and south) and set within the village of Bickenhill.

### **Designated and Development Land**

- 12.5.14. The study area is contained within the Meriden Gap, an area of land protected by SMBC green belt designation. Whilst holding no formal designation for community purposes, the greenbelt is valued by the local community as a means of preventing urban growth south of the A45.
- 12.5.15. No land allocated for future development is present within the 250m study area.

### **Community Land and Facilities**

- 12.5.16. No parks, allotments, town or village greens or common land are located within the 250m study area.
- 12.5.17. The following public spaces are present within the 250m study area and are used by the community:
- Bickenhill Meadows SSSI;
  - Aspbury's Coppice LWS;
  - Castle Hill Farm Meadows LWS;
  - Shadowbrook Meadows Nature Reserve;
  - Holywell Brook LWS;
  - Main Birmingham to London Railway line Ecosite;
  - Bickenhill Churchyard Ecosite; and
  - Clock Lane Meadows (part of the Castle Hill LWS).
- 12.5.18. In addition, the Church of St Peter is located within the centre of Bickenhill Village (See Chapter 7: Cultural Heritage).

### **Commercial**

- 12.5.19. Commercial businesses identified within the 250m study area comprise the following:
- The Birmingham Dogs Home: Located off Catherine De Barnes Lane (B4438) immediately south of Bickenhill Lane.
  - Bracey's Nursery and Garden Centre: Located immediately east of the existing Catherine De Barnes Lane (B4438), to the north of Shadowbrook Lane.
  - Avon Caravan Park: Located to the immediate north west of Bickenhill off Catherine De Barnes Lane (B4438).
  - GAA: Located off the existing B4438 Catherine De Barnes Lane immediately adjacent to the Bracey's Nursery and Garden Centre, comprising three playing fields and associated facilities including a clubhouse, pavilion and minimal parking provisions. It is considered the principal Gaelic games sports facility in the West Midlands, and is the home of the British Council GAA.
  - Two equestrian facilities are also located within the 250m study area within Bickenhill. The first is located off Church Lane, and the second is located off St Peter's Lane. The assessment has yet to establish whether these are commercial businesses or private facilities.

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## **Agricultural**

- 12.5.20. The 250m study area is predominantly agricultural in use and includes the following farms: Walford Hall Farm; Hampton Lane Farm; Four Winds Farm; Heath Farm; Hazel Farm; Home Farm; Grange Farm; Health End House; Glebe Farm.
- 12.5.21. The agricultural land within the study area is predominantly arable fields which are well defined by field boundaries. To the south of the study area in between Solihull Road and Shadowbrook Lane and to the west of the existing Catherine De Barnes Lane, the field network comprises of large fields typical of arable farming. Further north through the study area, the field boundaries become small and more compact which is associated with the medieval origins of Bickenhill and become larger around the south of Clock Interchange.
- 12.5.22. Available information regarding the ALC grading of farmland within the 250m study area is presented in Chapter 9 – Geology and Soils.

## **12.6. Potential Impacts**

### **Construction Phase**

- 12.6.1. The following sections present a summary of the preliminary assessment of potential impacts arising from proposed scheme construction.

#### *NMUs*

- 12.6.2. A detailed assessment of potential impacts on NMUs has yet to be undertaken; however, construction of the proposed scheme is expected to impact on the ability of users to physically access existing routes and crossing points on the PRow and local road network. The presence of construction traffic, activities and operations through disruption from traffic related activities may also alter the experience of users currently making journeys on these routes.
- 12.6.3. The assessment has identified that impacts are likely to affect users of the following routes, as these have a direct relationship to the proposed scheme: M123; M122; M113a; M113; M109; M110; M106; the Green Man Trail; and the Traffic Free Cycle Lane.
- 12.6.4. It is expected that route diversions and temporary closures would be required to facilitate construction, resulting in some inconvenience to NMUs and equestrian users and potentially requiring them to make alternative travel arrangements during the works. Consequently, impacts on users would arise from incurring lengthier journeys and having to use alternative routes. Construction works in proximity to any existing or diverted routes may also result in a reduction in the overall amenity and pleasantness of journeys made by users.
- 12.6.5. Construction would also result in the severance of some routes, requiring either their permanent closure or an alternative means of access being incorporated in the design of the proposed scheme. Such impacts have been identified and reported as part of the operational assessment, as these would have long term implications of journeys made by NMUs.

#### *Vehicle Travellers*

- 12.6.6. Construction activities may result in some delay and disruption to drivers on the road network. There could be increased frustration, uncertainty and fear for drivers during

the works, for example through lane closures, route diversions or by repeatedly encountering sections of road under traffic management conditions.

- 12.6.7. Works on the road network would also modify the composition of views available to vehicle travellers, with construction working areas introducing a new focus in some views.
- 12.6.8. Any adverse impacts on driver stress or views from the road during construction are likely to be temporary in duration.

#### *People and Communities*

- 12.6.9. In relation to private properties, the assessment has identified that construction of the proposed scheme would require the unavoidable demolition of one dwelling (Heath End House). An assessment has yet to be undertaken of whether landtake from other private properties in close proximity to the proposed scheme would be necessary. The avoidance of such impacts remains a key consideration in the proposed scheme design-development process.
- 12.6.10. With regard to commercial businesses, the assessment has identified that landtake would be required from within the GAA football and hurling fields to facilitate construction, which would impact this interest to the extent that it would no longer be operationally viable and would have to be relocated. Although no direct impacts are expected on the other business identified within the 250m study area, potential exists for construction-related disruption to occur which could affect passing and/or regular trade, for example by temporarily reducing accessibility from the road network.
- 12.6.11. For agricultural enterprises, the assessment has identified that some land would need to be temporarily taken to construct the proposed scheme, in addition to that required permanently. Areas of agricultural land would be needed to accommodate working areas, construction compounds and laydown areas, the preliminary assessment of which indicates that approximately 36 ha would be required for short-term use. The potential implications on farm viability and ALC grades have yet to be assessed; however, it is expected that temporary landtake could adversely affect the current operations and farming regimes of some agricultural farm units.

#### **Operational Phase**

- 12.6.12. The following sections present a summary of the preliminary assessment of potential impacts arising from operation of the proposed scheme.

#### *NMUs*

- 12.6.13. Operation of the proposed scheme is expected to permanently affect NMU journeys and their experience as a consequence of the severance and/ or realignment of the following routes:
- **PRoW M123:** This PRoW provides an off line traffic free pedestrian route south to north from Solihull Road to Shadow Brook Lane, and would be permanently severed to the north of Hampton Lane Farm. It is proposed this NMU route would be stopped up north of the interchange with M122.
  - **PRoW M122:** The PRoW provides an off line traffic free pedestrian route west to east from the B4438 to Shadow Brook Lane, and would be permanently severed in two locations to the east of the existing B4438. It is proposed this NMU route would be stopped up in its entirety.

- **PRoW M113a:** This PRoW would be subject to realignment and reintegration into the proposed scheme, which is not expected to markedly affect users of this route or its relationship to PRoW M113.
- **PRoW M113:** This PRoW would be severed where it meets the B4438 immediately west of Bracey's Nursery and Garden Centre.
- **PRoW M112:** The proposed scheme would likely sever this PRoW to the immediate west of the existing B4438 to facilitate the bypass and the proposed Bickenhill roundabout. The wider viability of the PRoW would remain intact and it is likely the proposed works would reintegrate the PRoW back with the road network. It is, however, noted that the bypass may result in an inhibiting movements from Castle Hill in the west to Bickenhill. There is the possible alternative route for similar NMU movement (M109), however, potential impacts on M109 are similar to that of M112.
- **PRoW M109:** The proposed scheme would sever the PRoW to the immediate west of the village of Bickenhill as the proposed scheme passes from the west of the existing B4438 to the east through the narrowing to the north of village extents. The wider viability of the PRoW would remain intact and it is likely the proposed works would reintegrate the PRoW in an appropriate form back with the road network. It is however noted that the bypass may result in an inhibiting movements from Castle Hill in the west to Bickenhill. There is the possible alternative route for similar NMU movement (M112), however potential impacts on M112 are similar to that of M109.
- **PRoW M106:** The proposed scheme would sever the PRoW to facilitate the works at Clock Interchange. The PRoW provides a NMU route to Clock Interchange and there are no alternative traffic free routes available. The PRoW forms part of the Green Man Trail and as such should be considered in the wider context of route this asset provides. It is proposed this NMU route would be stopped up.
- **The Green Man Trail:** The trail whilst not designated as a standalone route, does rely upon a number of PRoWs that form the trail. One of the PRoWs (M106) would be permanently severed as a result of the works around Clock Interchange, which as a result would severe the Green Man Trail.
- **Traffic-free cycle lane:** It is likely the existing traffic free cycle lane that runs in parallel to the B4438 Catherine De Barnes Lane would be permanently lost due to proposed works to tie the B4438 into the new bypass.

12.6.14. No operational impacts are currently predicted on PRoW M107, M110 and M111 as the proposed scheme is not expected to directly affect these routes. There is the potential that the proposed scheme may result in disruption to NMU's and equestrian users from operational traffic, which will be considered as part of the EIA.

#### *Vehicle Travellers*

12.6.15. An assessment has yet to be undertaken of the likely views available from vehicles travelling along new and improved sections of highway as a result of the proposed scheme. It is expected that, in the long term, the proposed scheme may result in the closure of some existing views and the opening up of new views into surrounding areas. The visual outlook from vehicles may also be modified where components of the proposed scheme emerge as new features in views from the local highway.

12.6.16. It is expected that drivers travelling along new and modified sections of highway would be offered a clearer road layout, with appropriate signage and a high standard of surfacing. This, coupled with the reduction in traffic congestion, would improve the standards and conditions of journeys made on the network and would reduce the current sources and levels of stress in drivers.

*People and Communities*

12.6.17. Operational impacts on private properties are likely to be associated with the potential exposure to changes in traffic flows. The effects of these changes have yet to be assessed, but it is expected that some dwellings would experience increases and decreases in air quality and noise as a result of the operational traffic. These impacts are considered further in Chapters 5 and 11.

12.6.18. The assessment of operational impacts on commercial businesses is ongoing; however, it is expected that there could be long-term implications on how the GAA facility operates as a consequence of its relocation. Other impacts relate to whether existing businesses would indirectly benefit from, or be affected by, long term changes in traffic flows in terms of passing trade.

12.6.19. The long term operational viability of individual agricultural units has yet to be established; however, permanent landtake would be necessary to accommodate the engineering components and environmental mitigation of the proposed scheme, such as landscaping and drainage. The assessment will further examine the implications of landtake, taking into account any temporary land that would be restored and returned back to landowners post construction. Consideration will also be given to whether any best and most versatile agricultural land lost to the proposed scheme is considered significant in the context of the 20ha threshold stipulated in the Town and Country Planning (Development Management Procedure) Order 2010.

## **12.7. Design, Mitigation and Enhancement Measures**

12.7.1. An NMU strategy for the proposed scheme is currently being refined as the detailed preliminary design is being undertaken. However, at present a number of alternative NMU provisions to mitigate the severance or loss of the NMU affected by the proposed scheme have been drafted. These include:

- A proposed cycleway/footpath along the length of the realigned B4438 Catherine De Barnes Lane, from the proposed Catherine De Barnes roundabout in the south to the proposed St Peter's Lane Overbridge in the north.
- A replacement footpath that commences off the existing M123 and follows the alignment of the Catherine De Barnes roundabout and the link road on to and off the proposed bypass, the proposed footpath would then merge in the proposed cycleway/footpath along the B4438.
- A proposed footpath and bridleway would commence to the south of Shadowbrook Lane and follow the alignment of the proposed bypass northwards on the western side on the lip of cutting for the bypass, it would pass Bickenhill village and merge into the wider proposed cycleway/footpath on the B4438 at the proposed St Peter's Lane Overbridge.
- A proposed footpath would be provided to the east of Clock Interchange and run in a southerly direction merging to the north eastern extent of Bickenhill village. The

footpath would provide a replacement to the element of the lost Green Man Trail on M106.

12.7.2. Mitigation is currently being considered as part of the design-development of the proposed scheme to avoid or reduce potential impacts on people and communities. Measures which are being developed and/or evaluated include the following:

- The use of temporary closures, diversions and traffic management to manage potential impacts on PRow and other routes affected by the proposed scheme.
- The inclusion of NMU proposals in the design which meet, as a minimum, the provisions that would be affected by the proposed scheme (in terms of location, accessibility and connectivity to the wider network) and investigation of whether enhancements can be implemented elsewhere to promote better access and use of the network.
- The use of landscaping and earthworks to improve the visual integration of visually prominent components of the proposed scheme in views from the road.
- The development of the design to incorporate measures such as lighting and signage to reduce driver stress.
- The restoration of land temporarily taken during construction, and the potential to grade earthwork slopes out to permit return to agricultural use.
- Refinement of the proposed scheme design to minimise temporary and permanent landtake requirements.
- Where landowners may be affected by demolition and/or landtake, their eligibility for compensation in accordance with established procedures would be investigated.
- The identification and securing of appropriate 'exchange land' to compensate for the loss of the GAA facility.
- The development of accommodation works in the design to address potential impacts on agricultural units, such as new tracks and gates to maintain agricultural access.

12.7.3. Some of these measures constitute best practice measures to be implemented by the contractor through the framework of a CEMP during construction. It is expected that the CEMP would include specific measures to: control traffic on the road network; minimise disruption to private dwellings, commercial businesses and agricultural units (for example through local liaison and notification of disruptive works); segregate NMUs from working areas; and strip, handle, store and reinstate agricultural soils in an appropriate manner.

## **12.8. Assessment of Effects**

12.8.1. The preliminary assessment has concluded that, prior to the implementation of mitigation measures, potential exists for effects to occur on a range of people and communities as a result of construction and operation of the proposed scheme.

12.8.2. Further work is planned to fully establish the existing conditions against which detailed impact assessments will be undertaken and reported in the ES. Surveys and consultation will also be carried out to inform the proposed scheme design-development process and refine the preliminary mitigation measures, such that an assessment can be made of their role in reducing potentially significant effects on NMUs, vehicle travellers, and private and community assets.

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## **13. ROAD DRAINAGE AND WATER ENVIRONMENT**

### **13.1. Introduction**

13.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on surface water, groundwater, flood risk and hydromorphology of water bodies.

13.1.2. The approach to the assessment and the methods being used to identify potentially significant effects on the water environment are set out in the M42 Junction 6 Improvement Scheme EIA Scoping Report. The objective of this assessment is to provide a preliminary assessment to identify any potentially significant effects upon road drainage and the water environment that are likely to arise from construction and/or operation of the proposed scheme.

13.1.3. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of water environment effects associated with highway-based improvements.

### **13.2. Stakeholder Engagement**

13.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and records concerning the water environment within defined study areas, and to develop the assessment scope.

13.2.2. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the water environment assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- The assessment should identify the potential impacts to the Grand Union Canal as a result of the drainage arrangements.

13.2.3. Consultation will continue with the EA, SMBC (who are the Lead Local Flood Authority (LLFA)), and Seven Trent Water (STW) through the EIA process to: further refine the adopted study area (described below); the proposed surface water management system; the magnitude of predicted impacts and the significance of effects on the water environment; and agree appropriate mitigation measures.

### **13.3. Assessment Assumptions and Limitations**

13.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.

13.3.2. The findings of the preliminary assessment may be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further research and investigative surveys are undertaken to fully understand its potential effects.

### **13.4. Study Area**

13.4.1. The process of scoping identified that a 1km study area around the proposed scheme boundary would be appropriate to identify any potential effects on the water environment. Within this study area the known surface water features and their attributes have been identified, the extent of known flood risk has been determined, and the current groundwater conditions described. In addition, factors such as



historical contamination that may influence the hydrology of the study area have also been considered.

13.4.2. Water features located outside the study area, but immediately within its surrounds, have been included where it appears that there is hydraulic connectivity to features within the study area and the possibility that they could be significantly affected by the proposed scheme. Professional judgment has been applied to identify the extent to which such features are included.

13.4.3. The flood risk study area comprises Environment Agency Flood Zones along the watercourses that may be affected by the proposed scheme. The EA designates flood risk zones on the basis of the annual probability of a flood event to occur as follows:

- Zone 1 is less than 0.1% annual probability of flood risk (i.e. a very low risk of flooding).
- Zone 2 between 0.1 - 1% annual probability of flood risk (i.e. a low risk of flooding).
- Zone 3 is more than 1% annual probability of flood risk (i.e. a medium risk of flooding).

13.4.4. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area used for the assessment will be presented within the ES for the proposed scheme.

### **13.5. Baseline Conditions**

13.5.1. The following tasks have been undertaken to date to establish the baseline conditions that exist within the adopted study area:

- A review of relevant legislation, planning policy and guidance concerning the surface water, groundwater, flood risk and hydromorphology of water bodies;
- Desk-based review of water resource records obtained from third party sources including: the EA, SMBC, STW; Ordnance Survey mapping; aerial photography; and other web-based information sources.
- A review of published studies undertaken to inform route optioneering and selection at PCF Stage 2.
- A site visit (undertaken on 26th October 2017 in dry conditions) to allow water receptors in the area to be assessed in terms of their character and morphology, and their connectivity to the proposed scheme taking account of the surrounding topography and receptor sensitivity (e.g. nearby sites of ecological importance) (See Appendix 13).

#### **Surface Water Receptors**

13.5.2. Based upon the site visit and a review of available data, the following surface water bodies have been identified within the study area (refer to Figure 13.1):

- Hollywell Brook - Main River;
- Shadow Brook - Main River;
- Tributary of Shadow Brook - Ordinary Watercourse;
- Low Brook - Main River;
- River Blythe - Main River;
- Grand Union Canal (Solihull to Birmingham);

- Pendigo Lake;
- Several small ponds; and
- Several field drains and ditches.

### **Geology, Groundwater and Soils**

- 13.5.3. According to the British Geological Survey website, the bedrock underlying the study area consists predominantly of Sidmouth Formation Mudstone. There are some areas of Branscombe Mudstone Formation - Mudstone, notably to the northeast of the site and around Catherine De Barnes. Arden Sandstone Formation (Sandstone, Siltstone, Mudstone) is found in small patches including at the NEC, the immediate east of Bickenhill and south of Catherine De Barnes. Superficial deposits are generally sparse in the area, but there are small scattered patches of glaciofluvial deposits (sands and gravels), and this is more widespread around Catherine De Barnes. Alluvium is found in the immediate vicinity of the larger watercourses.
- 13.5.4. According to the EA's What's In My Backyard website, the bedrock aquifer designation is Secondary B. These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of former non-aquifers. The superficial aquifer designation is a mixture of non-classified and Secondary A aquifer. The designated areas are predominantly to the north of Junction 6 of the M42, and southwest of the Catherine de Barnes roundabout at the south of the study area. There are additional thin strands on Secondary A aquifer in the immediate vicinity of the fluvial watercourses in the study area. Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of baseflow to rivers.
- 13.5.5. According to the Cranfield Soil and Agrifood Institute Soilscales website, the study area is underlain by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.
- 13.5.6. There are no groundwater source protection zones in the vicinity of the proposed scheme. However, the majority of the study area does lie within a drinking water safeguard zone.
- 13.5.7. The EA Catchment Data Explorer website indicates that the study area lies within the 'Tame Anker Mease - Secondary Combined' groundwater body (GB40402G990800). Under the 2016 Cycle 2 classification this has an overall Water Body Status of Good, with both Good Qualitative and Good Chemical Status.
- 13.5.8. Borehole data including level information was requested from the EA, but there are no boreholes in the study area or vicinity within 5km of the proposed scheme.

### **Abstractions**

- 13.5.9. The WSP/ Mouchel PCF Stage 2 EAR (May,2017) indicates that there is a medium sized surface water abstraction point north-east of the proposed scheme, east of Little Packington on the River Blythe, which is used for agriculture or private purposes. There is also a small sized single groundwater abstraction point for agricultural processes approximately 1km north of the junction along the A452, west of Little Packington. Further details on current abstractions were requested from the EA, but not further abstractions are recorded.

## Water Quality

13.5.10. No surface water quality data are available for Hollywell Brook or Shadow Brook from the EA. However, the EA was able to provide surface water quality data for a site known as Eastcote Brook, which is a tributary of the River Blythe and part of the designated Blythe from Temple Balsall Brook to Patrick Bridge watercourse immediately to the east of the proposed scheme. This is treated sewage effluent monitored as it leaves the Barston Sewage Treatment Works at Friday Lane. A summary of available data is provided in Table 13.1, and shows elevated concentrations of ammonia, BOD, phosphorus and iron.

**Table 13.1: Water Quality Data for the Blythe from Temple Balsall Brook to Patrick Bridge (provided by the EA)**

Determinand	Mean Average	90 <sup>th</sup> Percentile
BOD ATU, mg/l	4.14	7.00
COD as O2, mg/l	46.92	62.00
Ammonia (N), mg/l	1.21	2.86
Suspended Solids, mg/l	9.52	14.00
Phosphorus-P, mg/l	0.71	1.06
Iron - as Fe, ug/l	1,286.42	2,010.00

13.5.11. As part of the water resource impact assessment, additional water quality monitoring will be undertaken at Hollywell Brook and Shadow Brook to better understand baseline conditions and provide input data to the quantitative assessment of road runoff impacts. This will include collecting three water samples from each of these watercourses in winter 2017, spring 2018 and summer 2018. The precise locations of sampling are yet to be determined and will be informed by the preliminary drainage strategy. Each sample will be tested for a range of physico-chemical parameters, metals and hydrocarbons that may typically be found in road runoff.

## Flood Risk Baseline

13.5.12. The following flood risk baseline is based on publically available information including the Preliminary Flood Risk Assessment (PFRA)<sup>31</sup>, Environment Agency Interactive Flood Maps (online) and consultation with the EA. Flood risk baseline maps are shown in Figure 13.1.

## Tidal Flood Risk

13.5.13. The proposed scheme is not at risk of tidal flooding.

## Fluvial Flood Risk

13.5.14. The proposed scheme would cross four watercourses (Hollywell Brook, Shadow Brook, tributary of Shadow Brook and tributary of Pendigo Lake) as identified by OS mapping, with a further two watercourses (River Blythe and Low Brook) in close proximity (<1km) to the proposed scheme. Of these six watercourses, four are considered Environment Agency Main Rivers (see Figure 13.1).

<sup>31</sup> WSP (2011) Solihull Metropolitan Borough Council Preliminary Flood Risk Assessment. Available at: <http://www.solihull.gov.uk/Portals/0/CrimeAndEmergencies/PFRA.pdf>

13.5.15. The majority of the proposed scheme is located in Flood Zone 1 and is therefore considered to have a low risk of flooding. Flood Zone 1 comprises land assessed as having a less than 1 in 1,000 year, or 0.1% Annual Exceedance Probability (AEP) of fluvial or tidal flooding in any given year. Given the proposed use of the proposed scheme (highway), development within these areas is considered acceptable from a fluvial flood risk perspective.

13.5.16. Flood risk areas and the proposed scheme watercourse crossing locations identified above are assessed below:

- **Hollywell Brook:** Hollywell Brook is located to the north of the proposed scheme and connects Pendigo Lake to the River Blythe through a series of culverts beneath infrastructure including the M42. The land surrounding Hollywell Brook is located within Flood Zone 2 and 3 (refer to Figure 13.1). Alternative floodplain compensation would be required for any land lost due to the proposed scheme within the floodplain (Flood Zone 3) so as not to increase flood risks.
- **Shadow Brook:** Shadow Brook (Main River from downstream of the M42) originates in the central area of the proposed scheme, approximately 30m west of the existing M42 alignment in surrounding agricultural land. The brook flows east and is culverted beneath the M42, before flowing north east and through another series of culverts before reaching the confluence with the tributary of Shadow Brook. Shadow Brook then continues to flow east before discharging into the River Blythe. In the location of the Brook prior to the crossing beneath the M42, land adjacent to the watercourse is classed as Flood Zone 1 (low risk of fluvial flooding). To the land east of the M42, the land adjacent to Shadow Brook is classified as Flood Zone 3 (high risk of fluvial flooding).
- **Tributary of Shadow Brook:** The tributary of Shadow Brook is located in the central area of the proposed scheme and is classified as an Ordinary Watercourse. The watercourse originates west of the M42 by Shadow Brook Lane, before flowing north east towards the M42 where the stream is culverted beneath the highway infrastructure. The watercourse passes through a series of culverts beneath transport infrastructure before reaching its confluence with Shadow Brook, approximately 1.5km to the east. Land directly adjacent to the tributary and the wider area is located entirely within Flood Zone 1 (low risk of fluvial flooding).
- **Pendigo Lake Tributary:** A small unnamed watercourse flows north from the A45 by the west arm of Junction 6. The watercourse is culverted beneath the A45 on the west arm of the junction, originating from Wyckhams Close. The watercourse continues in an open channel until it is culverted beneath highway infrastructure associated with the NEC car parks and highway infrastructure. It is assumed the watercourse discharges into Pendigo Lake via a culvert, but this is not confirmed. Land directly adjacent to the tributary and the wider area is located entirely within Flood Zone 1 (low risk of fluvial flooding).
- **Low Brook:** The Low Brook is located approximately 500m south west of the M42 Clock Interchange, and is classified as an Ordinary Watercourse (see Figure 13.1). The brook flows west before being extensively culverted beneath Birmingham International Airport infrastructure and finally discharging into Hatchford Brook. The extent of Low Brook within close proximity to the proposed scheme is mainly located within Flood Zone 1 (low risk of fluvial flooding). Low Brook drains away

from the M42 Clock Interchange, as such it is not anticipated that flood risk from Low Brook will alter as a result of the proposed scheme.

- **River Blythe:** The River Blythe, an Environment Agency Main River, is located approximately 500m south of the proposed scheme. The river flows in an easterly direction and passes through a modified open channel beneath the M42. The river continues to meander through Barston and begins flowing north, approximately 2.2km east of the proposed scheme. Land surrounding the immediate area of the River Blythe is classified as Flood Zone 2 and 3 (medium and high risk of flooding respectively). Given the distance of the watercourse from the highway and topography of the land, there is anticipated to be a negligible risk of flooding from the River Blythe to the proposed scheme.

#### **Flood from Artificial Sources**

- **Reservoirs:** Pendigo Lake, located approximately 300m west of the proposed crossing with Hollywell Brook, is classified as a reservoir on the EA online Long-term Risk of Flooding map. However, the EA maps indicate that the proposed scheme is not located in an area at risk of flooding from reservoirs.
- **Ponds and Lakes:** A review of online OS mapping and aerial imagery has identified there are no surface water features (lakes or ponds) located along the route of the proposed scheme. There are a number of ponds within 1km of the proposed scheme; however, the risk of flooding from these ponds is expected to be localised and will not pose a significant flood risk to the proposed scheme.
- **Canal:** The Grand Union Canal is located approximately 450m south west of the proposed scheme. Canal flooding can occur as a result of the facility being overwhelmed or as a result of dam or bank failure. Due to the distance between the proposed scheme and the canal, and the topography of the surrounding area, the risk of flooding to the proposed scheme is negligible.

13.5.17. Based on the information above, the risk of flooding from artificial sources is considered to be low. However, the waterbodies identified should be assessed in more detail to ensure they would not affect the proposed scheme.

#### **Groundwater**

13.5.18. The underlying geology across the site is discussed in Section 13.4. The EA's National Areas Susceptible to Groundwater Flooding (AStGWF) dataset provides the basis for assessing future flood risk from groundwater. The mapping is based on the BGS 1:50,000 Groundwater Flood Susceptibility Map and covers consolidated aquifers (chalk, sandstone etc.) and superficial deposits. The mapping does not take account of the chance of flooding from groundwater rebound. It shows the proportion of each 1km grid square where geological and hydrogeological conditions indicate that groundwater might emerge. The Preliminary Flood Risk Assessment (PFRA) includes mapping showing the AStGWF, and indicates the entire length of the proposed scheme is located in an area at <25% chance of groundwater emergence. The PFRA confirms there have been no confirmed incidents of groundwater flooding within the borough.

13.5.19. Further ground investigations will be undertaken to assist with the design of the proposed road cuttings and deep excavations. Should such investigations indicate that there is a risk of groundwater emergence along the route alignment, further mitigation and drainage provisions would be required.

13.5.20. Given the proposed scheme is located above a Secondary B aquifer comprising relatively impermeable bedrock, it is unlikely there will be any significant effects from the proposed scheme on groundwater flooding.

13.5.21. Based on the adoption of appropriate mitigation strategies, the risk of flooding from groundwater emergence at this site is considered to be low.

#### **Flooding from Drains and Sewers**

13.5.22. Given the rural nature of the area surrounding the proposed scheme, the current flood risk from sewers and drains is considered to be low.

#### **Sites of Ecological Importance**

13.5.23. As detailed in Chapter 8, there are a number of statutory designated sites of ecological importance within the vicinity of the proposed scheme:

- **River Blythe SSSI:** lowland river on clay with diverse morphological features and plant communities. It has a status of 'Unfavourable - Recovering';
- **Bickenhill Meadows SSSI:** featuring natural lowland grasslands and located west of the M42. It has a status of 'Unfavourable - Recovering'. This area features habitats that may be groundwater dependent. The tributary of Shadow Brook flows through the middle of the SSSI; and
- **Shadowbrook Meadows Local Nature Reserve:** included within the Bickenhill Meadows SSSI to the north of Shadowbrook Lane. The site is 4.4ha in area and consists of four fields incorporating both wet and dry meadows and a wet alder woodland with pollarded willows around its margin.

#### **Importance of Receptors**

13.5.24. Based on the baseline data as presented above, the key local water resources receptors within the study area are as follows (together with their importance):

- **River Blythe:** Very high importance on the basis of being a SSSI and despite poor to moderate Water Framework Directive (WFD) status;
- **Shadow Brook, Hollywell Brook and Low Brook:** High importance on the basis of discharging directly into the River Blythe SSSI and/or being tributaries of WFD reporting reaches. The tributary of Shadow Brook also runs through the Bickenhill Meadows SSSI.
- **Grand Union Canal:** High importance on the basis of being a navigable waterway;
- **All Other Watercourses:** Medium to low importance, with the majority of these being agricultural ditches and drains without nature conservation designations and minimal social and economic use.
- **Pendigo Lake:** Medium importance as it is an online lake to Hollywell Brook and a popular site with anglers and tourists to the NEC;
- **Ponds identified as having GCN (see Chapter 8 - Biodiversity):** High importance on the basis of containing species protected by law.
- **Other Ponds:** Low importance as they are not designated and have minimal social and economic use.
- **Groundwater:** Medium importance as the WFD groundwater body has a classification of Good, but the site is not Principal aquifer.

- **Flood risk:** In general flood risk for the proposed scheme is of medium importance given the predominantly agricultural setting.

13.5.25. The importance of water resource receptors will be reviewed and confirmed in the ES.

### 13.6. Potential Impacts

13.6.1. An assessment of the value of affected assets, the type and magnitude of impact likely to arise during the construction and operational phases of the proposed scheme, and the significance of effect(s) will be undertaken in accordance with methodology and criteria presented in the EIA Scoping Report. The results from the assessment will be reported in full in the ES. Given that the proposed scheme design is subject to confirmation, the preliminary water resource assessment presented below is necessarily qualitative.

13.6.2. The proposed scheme has the potential to impact upon the water environment during construction and operation phases - potential impacts are described below.

#### Construction Impacts

13.6.3. During construction the following water environment impacts may occur if appropriate mitigation is not applied:

- Reduction in water quality, both surface and groundwater, due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater, or through uncontrolled site run-off;
- Alteration in fluvial and overland flow paths, and potential increase in flood risk, as a result of storing construction materials in floodplains;
- Increased risk of blockage of drains as a result of increased material (sands, gravels etc.) transported in runoff from the site;
- Increased discharge to local watercourses due to a temporary increase in impermeable area during construction.

#### Operation Phase

13.6.4. During proposed scheme operation the following water environment impacts may occur if appropriate mitigation is not applied:

- Impacts on surface or groundwater quality from highway run-off (including the use of de-icers) or as a result of accidental spillages;
- Impacts on hydrogeology from contaminant release during accidental spillages or via unlined sustainable drainage systems;
- Changes in the natural form of the landscape, which may have a subsequent impact on surface water drainage patterns, including adverse impacts on local nature conservation sites;
- Increased risk of fluvial flooding to the proposed scheme and surrounding area due to loss of floodplain storage;
- Increase in flood risk (fluvial, surface water, sewer and drainage infrastructure) due to an increase in surface water runoff from the proposed scheme, and increased risk of fluvial flooding over the lifetime of the proposed scheme from climate change effects (increased peak river flows);

- Increased risk of groundwater flooding (particularly to any below ground development) as a result of high water table and/or groundwater recharge;
- Impacts on hydraulic processes and sediment dynamics in watercourses and their floodplains; and
- Loss of or changes to the morphology of water bodies that could have both temporary and long term impacts on the hydromorphological conditions of water bodies.

13.6.5. It is possible that improvements to the existing drainage network for the M42 and structures conveying watercourses beneath the M42 could potential result in beneficial effects on the water environment. However, until more information is available regarding the existing drainage systems, it is not currently possible to evaluate these potential benefits. Such benefits will be reviewed and reported in the ES.

### **13.7. Design, Mitigation and Enhancement Measures**

13.7.1. Environmental considerations have been taken into account during the development of the proposed scheme design, in order to reduce and/or avoid potential water resource impacts. This iterative approach has led to a range of mitigation measures capable of reducing the magnitude of water environment impacts being embedded within the proposed scheme design or captured within proposed construction practices.

#### **Construction Phase**

##### *Surface Water and Groundwater*

13.7.2. The risk of pollution to surface water and groundwater is greatest during the proposed scheme construction. Pollution may arise directly from spillages of oil or other polluting substances, or indirectly from runoff from hard standing and other sealed surfaces or from construction machinery that may contain high levels of suspended solids. However, potential impacts to the water environment would tend to be temporary and short term.

13.7.3. In order to avoid, prevent, minimise and reduce such adverse impacts, the proposed works would be undertaken by the appointed contractor in line with measures as set out in their CEMP. The CEMP would include mitigation measures that follow current good construction practices, such as those included within the following Construction Industry Research and Information Association (CIRIA) documents:

- C522 (2001) Sustainable Urban Drainage Systems - Design Manual for England and Wales<sup>32</sup>;
- C523 (2001) Sustainable Urban Drainage Systems - Best practice manual for England, Scotland, Wales and Northern Ireland<sup>33</sup>;
- C532 (2001) Control of water pollution from construction sites - Guidance for consultants and contractors<sup>34</sup>;
- C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice<sup>35</sup>;

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<sup>32</sup> C522 (2001) Sustainable Urban Drainage Systems – Design manual for England and Wales

<sup>33</sup> C523 (2001) Sustainable Urban Drainage Systems – Best practice manual for England, Scotland, Wales and Northern Ireland

<sup>34</sup> C532 (2001) Control of water pollution from construction sites - Guidance for consultants and contractors, Scotland, Wales and Northern Ireland

<sup>35</sup> C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice



- C624 (2004) Development and flood risk - Guidance for the construction industry<sup>36</sup>;
- C648 (2006) Control of Water Pollution from Linear Construction Sites - Technical Guidance<sup>37</sup>; and
- C741 (2015, 4th Edition) Environmental good practice on site guide<sup>38</sup>.

13.7.4. In addition, Pollution Prevention Guidance (PPG) documents published by the UK environment agencies although withdrawn in December 2015), also provide useful advice on the management of construction activities to avoid, minimise and reduce water environment impacts. As such guidance is still sought from the PPG documents when undertaking the relevant components of the water assessment.

#### *Flood Risk*

13.7.5. All construction materials and temporary compounds associated with proposed scheme construction should be located in Flood Zone 1. If water is encountered during below ground construction, suitable de-watering methods should be used.

13.7.6. During the construction phase the contractor would need to monitor weather forecasts on a monthly, weekly and daily basis and plan works accordingly. For example, works in the channel of any watercourse would be avoided or halted were there to be a risk of high flows or flooding. In addition, the contractor would be required to sign up to Environment Agency flood warning alerts and describe in the Emergency Response Plan (part of the contractors CEMP) the actions it would take in the event of a possible flood event. These actions would be hierarchal meaning that as the risk increases the contractor would implement more stringent protection measures. This is important to ensure all workers, the construction site and third party land, property and people are adequately protected from flooding during the construction phase.

#### **Operation Phase**

13.7.7. A number of mitigation features would be incorporated into the proposed scheme design in order to minimise water resource impacts, including:

- The channel designs for watercourse crossings would be developed and informed by hydromorphological, flood risk and ecological assessment. The design would need to ensure that existing flow conditions within the channels are maintained and not significantly impacted by constrictions such that there would be no significant adverse effects on channel flooding characteristics. The morphological and ecological function of these channels would also be taken into account during the design of new or modified structures, and where possible, opportunities for enhancement explored.
- New structures to cross watercourses should be of an open span design where possible with no new structures positioned in the channel and set back as far as possible from the top of the banks.
- The number of new surface water outfalls should be minimised to avoid construction of unnecessary structures along the river bank.
- The proposed scheme would be provided with an appropriate surface water management system, developed and constructed in compliance with DMRB. The

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<sup>36</sup> C624 (2004) Development and flood risk – Guidance for the construction industry

<sup>37</sup> C648 (2006) Control of Water Pollution from Linear Construction Sites – Technical Guidance

<sup>38</sup> CIRIA (2015) C741 Environmental Good Practice on Site guide

proposed drainage strategy will be defined in consultation with the EA, SMBC and STW and other statutory agencies, taking into account the findings of the Flood Risk Assessments (FRAs) and water risk assessment (to be prepared). The proposed drainage system would include the use of sustainable drainage systems (SuDS), where possible, to enable attenuation of surface water flows due to increases in the impermeable area as a result of the proposed scheme. SuDS would also provide treatment of runoff to ensure potential adverse effects on water quality are avoided.

- With regard to drainage into the watercourses, the extent of mitigation measures required to remove suspended solids, particulate and dissolved metals, and hydrocarbons etc. from road run-off will be determined through quantitative assessment of outfalls using DMRB HD45/09 HAWRAT Assessment Method A.
- Operation of the proposed scheme may alter the existing risk of road traffic accidents leading to a significant pollution incident. To mitigate the impacts on controlled waters, the highway drainage system would incorporate appropriate measures to minimise impacts associated with accidents and spillages by containing them upstream of receiving watercourses. The likelihood of accidental spillages will be determined following DMRB HD45/09 HAWRAT Assessment Method D.
- Floodplain compensation would be required for any land lost in Flood Zone 3 due to the proposed scheme so as not to adversely increase flood risk elsewhere. The requirements for such floodplain compensation are in the process of being investigated and will be reported in the ES.

### **13.8. Assessment of Effects**

13.8.1. This section presents the results of the preliminary assessment and considers the potential magnitude of impacts and significance of potential environmental effects as a result of the proposed scheme, whilst taking into account the implementation of likely mitigation measures as described in Section 13.7.

13.8.2. Further work will be undertaken as part of the assessment to develop, refine and agree mitigation measures for water resources. Once established and agreed with relevant statutory bodies, an assessment will be made of the role such measures would have in mitigating the effects as detailed below to reduce their significance. The final assessment findings will be reported in the proposed scheme ES.

#### **Surface Water Quality**

13.8.3. Where construction works are undertaken in close proximity to Hollywell Brook, Shadow Brook, Low Brook, their tributaries, or close to existing land drains connected to surface watercourses, and ponds, there is the potential for the following adverse impacts:

- Reduction in water quality, both surface and groundwater, due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals; and
- Mobilisation of contamination following disturbance of contaminated ground or groundwater, or through uncontrolled site run-off.

13.8.4. Such materials may be deposited or spilled directly into the watercourse, enter the watercourse via uncontrolled surface runoff, or enter indirectly via drains. During

construction, any discharges to surface water of 'unclean runoff' would require a Water Activity Permit from the EA. The conditions attached to any such consent, and to limits on oils, suspended solids and other pollutants, would need to be adhered to.

- 13.8.5. Preliminary drainage designs indicate that there would be two new outfalls (new outfall to Shadow Brook and outfall from an existing land drain on the southeastern side of the Clock Interchange) and two culvert extensions (Hollywell Brook and along the small watercourse that flows beneath the A45 south of Pendigo Lake) associated with the proposed scheme, which would require construction in immediate proximity to watercourses. There would also be the potential for conveyance of spills and fine sediment to result in indirect impacts on downstream receptors including Pendigo Lake, Low Brook and the River Blythe.
- 13.8.6. The adoption of the mitigation measures described in the Section 13.7 would minimise any potential for adverse surface water quality impacts. Therefore, it is considered that the construction works would have a potential negligible to slight adverse impact upon water quality in the vicinity of the proposed scheme, resulting in potential neutral to slight adverse effects.
- 13.8.7. The Grand Union Canal is in close vicinity to the potential construction works but due to the topography is not considered to receive contaminants from surface water drainage, as it is sited upslope from the works. As such, there will be negligible effects to the surface water quality of the Grand Union Canal.
- 13.8.8. There are a number of ponds in the study area that could be impacted by the proposed scheme (See Chapter 8: Biodiversity). Some of these ponds may be lost during construction or would suffer direct impacts (e.g. partial backfilling) or may be located in a flood compensation area. Those most likely to be impacted are found in the area bordered by Shadowbrook Lane to the north, Solihull Road to the south, Catherine De Barnes Lane to the west and High Street to the east. The potential impacts to any water features with ecological value will be evaluated and considered in conjunction with the biodiversity assessment within the ES.

#### **Surface Water Flow**

- 13.8.9. Proposed scheme construction has the potential to temporarily change the flow regime of Hollywell Brook, Shadow Brook, the tributary of Shadow Brook, Low Brook, the stream south of Pendigo Lake and numerous drainage channels that may convey flow to downstream waterbodies. This could be due to blockages or the receipt of additional discharges. These watercourses would all be potentially at risk as they would accept surface water runoff from the area of the proposed scheme construction works. Works would be taking place up to, and in some cases, over all of these watercourses.
- 13.8.10. Construction would result in an additional impermeable area of carriageway draining through existing outfalls and to new outfalls. It is proposed that the new Bickenhill dual carriageway would outfall to Shadow Brook and a drain south of the Clock Interchange, which is assumed to discharge to Pendigo Lake/ Hollywell Lake. There would also be alterations to the impermeable area draining to the existing M42 outfalls at Hollywell Brook and Shadow Brook. The impermeable areas for the proposed scheme are yet to be ascertained, but will be considered in the impact assessment to be included in the ES.
- 13.8.11. Due to the increased impermeable area, there is the potential for increased surface flows to the surrounding watercourses during proposed scheme construction and operation. The preliminary drainage design indicates the use of attenuation ponds at

both of the new outfalls, subject to approval by the Civil Aviation Authority/ Birmingham Airport. Both Shadow Brook and the drain at the Clock Interchange which would receive flows are small watercourses of little more than 1m in width. There is, therefore, some potential for blockages, which could impede flow and result in localised flooding. During construction it would be ensured that watercourses are kept free from blockages.

- 13.8.12. Overall, the construction of the proposed scheme would increase the impermeable area discharging to narrow watercourses with potential for blockages. Assuming that appropriate mitigation measures would be put in place, it is considered that minor adverse impacts to surface water flow could potentially be experienced, resulting in a potential slight adverse effect.

### **River Morphology**

- 13.8.13. The main morphological impacts are linked to the extension of a culvert for Hollywell Brook under the M42 east of Pendigo Lake, and an extension of the culvert under the A45 for the stream flowing north towards Pendigo Lake (which may historically have been the headwaters of Hollywell Brook). The effects are likely to be linked to the level of impact to the flow regime and whether each structure would create a significant impoundment to flow immediately upstream. This could cause deposition of any sediment being carried during elevated flows, preventing transport of such material downstream. It could also encourage further deposition of fine sediment across the stream beds that already suffer from fine sediment pressures. This would be linked to the hydraulic influence of the structure and potential widening of the watercourse through the structure. It is also recommended that the new structure and extension to the structure incorporate a natural gravel bed that reflects the surrounding bed material. As it is currently uncertain what form the structure would take, this preliminary assessment currently assumes a worst case scenario (i.e. narrow culvert) which would result in a moderate adverse impact. Given the high importance of the receptor, this would result in a potential large adverse effect, if not appropriately mitigated.
- 13.8.14. A secondary potential morphological impact would be the crossing or loss of the source area of Shadow Brook to the east of Catherine De Barnes Lane and north of Hampton Lane Farm due to the new dual carriageway. However, the site visit to the area confirmed that the watercourse at this point was a dry, overgrown agricultural drain that is of limited value in terms of impact on the flow regime and sediment regime. The watercourse remained dry until it was downstream of the M42 where it becomes Main River. Given only a small loss of what is effectively a dry ditch at its source, the potential impact is considered negligible to minor adverse, resulting in a potential neutral to slight adverse effect. The main impact would likely be linked to the loss of the drainage capacity of the channel, but as it is assumed the surrounding land use would be changing, that would mean this would be of little impact to the landowner.

### **Groundwater: Flow and Quality**

- 13.8.15. Groundwater has been determined to be of medium importance as the WFD groundwater body has a classification of Good, but the site is not Principal Aquifer.
- 13.8.16. The excavation of cuttings and deep excavations has the potential to intercept groundwater, or perched groundwater levels. Any interaction with the groundwater during construction has the potential to temporarily change the hydraulic gradient in the area of the excavation. Methods for dealing with intercepted groundwater would need

to be included within the CEMP in order to ensure that they are discharged/ diverted without providing adverse impacts to receiving waterbodies.

- 13.8.17. The new 2.4km dual carriageway between Solihull Road and the Clock Interchange would predominantly be sited within a new cutting, and with the hydraulic gradient likely to be quite shallow in the gently undulating topography, this could intercept groundwater flows. This is considered to be a potential minor adverse impact, leading to a potential slight adverse effect.
- 13.8.18. Interception of groundwater flows has potential implications for Bickenhill Meadows SSSI, which is a potentially groundwater dependent terrestrial ecosystem divided into two separate areas. One area is located less than 250m east of a proposed new cutting. It seems likely that groundwater contributes to maintaining the wet meadows and woodland at this site considering that the tributary of Shadow Brook through the SSSI is dry and probably only carries flow during prolonged periods of heavy rainfall. Another patch of the SSSI lies west (and downslope) of the proposed dual carriageway within 200m of the new cutting, and again groundwater flows towards the SSSI could be intercepted by cutting.
- 13.8.19. A ground investigation along the route of the proposed scheme will be undertaken. This will enable determination of existing groundwater levels, and the likely extent of interference resulting from cuttings and excavation that could potentially draw out groundwater, and prevent it from reaching receptors that might depend on it (i.e. Bickenhill Meadows SSSI). The bedrock aquifer is Secondary B, indicating lower permeability layers which may store and yield only limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering (superficial deposits are limited). Storage of groundwater in the upper layers to be excavated may, therefore, be limited, which would reduce the impact to potential downslope receptors. This will be explored in further detail at the next stage of the assessment. However, at this stage as the SSSI is a very high importance receptor, minor to moderate adverse impacts on groundwater flows may occur and this would give a potential moderate to large adverse effect.
- 13.8.20. Wherever construction works are undertaken, there is potential for spillages or leakages of oil, fuel or other liquid chemicals to contaminate the ground, and subsequently leach into underlying groundwater. The most vulnerable areas would be along the cuttings for the new dual carriageway, and new pathways for potential pollutant migration could be created.
- 13.8.21. There are no planned discharges to groundwater in the preliminary drainage designs, whilst the geology is relatively impermeable in the study area. Given this, and providing that mitigation measures are implemented as included in the CEMP, then the potential impact to groundwater quality should be negligible to minor adverse, resulting in a potential neutral to slight adverse effect.

#### **Potential Pollution of Surface Watercourses: Routine Road Runoff**

- 13.8.22. The proposed scheme would result in a significant increase in impermeable area of carriageway where pollutants (including hydrocarbons, heavy metals and sediments) can accumulate and be washed into receiving watercourses as routine road runoff. The preliminary drainage designs propose to drain surface water from the operational road to Hollywell Brook, Shadow Brook and a drainage ditch at the Clock Interchange. This would occur through existing outfalls on Hollywell Brook and Shadow Brook and would introduce two new outfalls. From experience of undertaking previous assessments of

routine road runoff, it is expected that in the absence of mitigation there would likely to be significant effects on receiving watercourses. However, the HAWRAT Method A assessment will consider the extent of treatment (i.e. SuDS) required to mitigate against such adverse impacts, and this will inform the ongoing drainage proposals to ensure no adverse effects occur. Assuming the designed mitigation is implemented, there should be negligible to minor adverse impacts and a potential neutral to slight adverse effect from routine road run-off to receiving waterbodies.

#### **Potential Pollution of Surface Watercourses: De-icing**

- 13.8.23. De-icing salt is a potential pollution source from routine highway maintenance. No practical form of treatment can remove salt from carriageway runoff after road salting. The road surface of the proposed scheme may require 10 to 20 g/m<sup>2</sup> of salt in a precautionary salting, and prior to snowfall or rain followed by freezing the target would be 20 - 40 g/m<sup>2</sup> <sup>39</sup>. De-icing salt would potentially have an impact on the receiving aquatic ecosystem, which could result in a greater effect where the receiving watercourse is small, with limited dilution.
- 13.8.24. The effect from de-icing would be localised and generally of short duration. It would also generally occur in winter when fauna and flora may be less sensitive to the impact of de-icant salts. The impact assessment to be reported in the ES will investigate the Q95 flows for receiving waterbodies to determine the likelihood of dilution. However, given that outfalls are planned to the Clock Interchange drain and Shadow Brook, which can both be dry, it is predicted that a potential minor adverse impact may occur, giving a potential slight adverse effect at these locations. Given that Hollywell Brook is a larger watercourse with greater dilution potential, the potential impact here is likely to be negligible to minor adverse, giving a potential neutral to slight adverse effect.

#### **Potential Pollution of Surface Water: Accidental Spillages**

- 13.8.25. The increase in impermeable area associated with the proposed scheme has the potential to increase the risk of accidental spillage pollution. Watercourses would be protected so that the risk of a serious pollution incident would have an annual probability of less than 1% (equivalent to a return period of 1 in 100 years), unless they are considered to be sensitive (e.g. covered by a SSSI designation) in which case a more stringent annual probability of 1 in 50 years would be applied.
- 13.8.26. DMRB HD45/09 Method D provides a method for the assessment of pollution impacts from accidental spillages. This method gives an indication of the risk of an accidental spillage causing a pollution impact on receiving water bodies. This will be undertaken during the impact assessment to be reported in the ES when details on road lengths draining to each outfall are known. In general, the risk of pollution from accidental spillages is very low. As long as the appropriate mitigation measures are implemented, then potential impacts are likely to be negligible to minor adverse, thereby giving a potential neutral to slight adverse effect.

#### **Surface Water Ponds: Water Quality**

- 13.8.27. For ponds that are not directly lost or partly backfilled, it is considered there would be limited potential for negative impacts resulting from receiving unclean water from routine highway runoff or accidental spillages. This is based on all routine highway runoff during proposed scheme operation being directed to watercourses, and not the

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<sup>39</sup> The Control of Pollution (Oil Storage) (England) Regulations 2001

surface water ponds in the area. However, several ponds are located within potential flood compensation areas which could receive unclean water from adjacent watercourses during flood events. Overall, the magnitude of impact is expected to be minor adverse for those ponds in these areas, resulting in a potential neutral effect, except for the GCN ponds where the potential effect would be slight adverse.

### **Flood Risk**

- 13.8.28. Construction and operational activities at the proposed scheme could pose an increase in flood risk from fluvial, surface water and groundwater sources, if these risks are not appropriately managed and controlled effectively. Mitigation will be defined within a proposed scheme specific FRA that will address the risk of flooding to and from the proposed scheme from these sources, including future flood risk considering climate change. If these mitigation methods for the construction and operational phases are adhered to, the potential impact is considered negligible and potential effects neutral.

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## 14. CLIMATE

### 14.1. Introduction

14.1.1. This chapter presents the preliminary findings of an assessment into the potential effects of the proposed scheme on climate related topics. The approach to the assessment and the methods being used to identify potential climate effects are set out in the M42 Junction 6 Improvement Scheme EIA Scoping Report.

14.1.2. This chapter has been divided into two separate aspects:

- **Greenhouse gas (GHG) impact assessment:** The effects on climate change of GHG emissions arising from the proposed scheme, including how the proposed scheme would affect the ability of the UK Government to meet its carbon reduction plan targets; and
- **Climate change resilience assessment:** The resilience of the proposed scheme to climate change impacts, including how the proposed scheme design takes into account of the projected impacts of climate.

14.1.3. For purposes of clarity, this chapter addresses each of the two climate topic assessments separately where appropriate. In-combination effects of a changing climate and the proposed Scheme on the surrounding environment are considered in Chapter 15 Cumulative, In-Combination and Project-wide Effects of this PEI Report.

14.1.4. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of climate effects associated with highway-based improvements.

### 14.2. Stakeholder Engagement

14.2.1. Statutory and non-statutory bodies will be engaged as part of the assessment process to obtain background data, information and records concerning GHG emissions and climate within the defined study areas, and to develop the assessment scope.

14.2.2. Following receipt of the EIA Scoping Opinion in December 2017, the scope of the climate assessments has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- Supporting information such as the FRA for the proposed scheme should be used to inform the climate change resilience assessment.

14.2.3. Consultation will continue through the EIA process to: further refine the adopted study areas (as described below); discuss the magnitude of predicted impacts and the significance of effects on climate and agree appropriate mitigation measures.

### 14.3. Assessment Assumptions and Limitations

14.3.1. The information presented in this chapter reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the proposed scheme and the maximum likely extents of land take required for its construction and operation.

14.3.2. The findings of the preliminary assessment may be subject to change as the design of the proposed scheme is developed and refined through the EIA and consultation processes, and as further research and investigative surveys are undertaken to fully understand its potential effects.



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## 14.4. Study Area

### **GHG Impact Assessment**

- 14.4.1. The study area for the lifecycle GHG emissions impact assessment comprises all GHG emissions arising during construction and operation of the proposed scheme.

### **Climate Change Resilience**

- 14.4.2. The study area for the climate change resilience impact assessment comprises the entire proposed scheme construction footprint and the immediate surrounding natural environment.

## 14.5. Baseline Conditions

### **GHG Impact Assessment**

- 14.5.1. The baseline for the lifecycle GHG impact assessment is a Do-Minimum for construction and operation scenario whereby the proposed scheme does not go ahead.

### **Climate Change Resilience**

- 14.5.2. Historical climate data recorded by the closest weather station to the study area (Coleshill Weather Station) for period 1981 - 2010 indicates the following:
- Average annual maximum daily temperature was 13.8°Celsius.
  - Warmest month on average was July (mean maximum daily temperature of 21.8°C).
  - Coldest month on average was January (mean daily minimum temperature of 6.9°C).
  - Mean annual rainfall levels were 712.4mm.
  - Wettest month on average was October (73.1mm of rainfall on average for the month).
  - Driest month on average was February (43.8mm of rainfall on average for the month).
  - Windiest month on average was January.
  - Least windy month was August.
- 14.5.3. The Local Climate Impacts Profile for Birmingham (LCLIP) (2008) covers the metropolitan borough directly adjacent to the proposed scheme footprint, and analyses the impact that climate change and severe weather has had on Birmingham and the surrounding areas from 1998 to 2008. Within this ten year period, there were 75 significant weather events identified, some of which affected the whole West Midlands region. The tornado July 2005 event, the flooding events of June and July 2007, and the heatwave of July 2006 are the three most significant weather events in the West Midlands region within this ten year period. The scale of impacts resulting from these weather events demonstrates that disruption, damage and casualties have generally increased and impact levels intensified from 1998 onwards.
- 14.5.4. Specifically relating to highways, flooding on major roads has resulted in access and use issues, placing pressure on the Highways and Drainage Department of Birmingham City Council, the Environmental Agency, and the West Midlands Fire and Rescue Service.

14.5.5. The UK Climate Projections 2009 (UKCP09) for the West Midlands suggest that, by the 2050s, the region will experience:

- An increase in summer mean temperature of 2.6°C, and an increase in winter temperatures of 2.1°C.
- A decrease in summer mean precipitation of 17%, and an increase in winter mean precipitation by up to 13%.

## 14.6. Potential Impacts

### GHG Impact Assessment

14.6.1. There is good scientific evidence to show that our climate is changing because of emissions of GHG resulting from human activity, with global consequences. By the very nature of any transport infrastructure development, no matter the nature or level of mitigation measures implemented, GHGs will be emitted as materials are used and construction activity occurs.

14.6.2. The proposed scheme comprises a major road development project which involves significant construction materials and activities (including changes in land use). On this basis, all lifecycle stages have been scoped in for the lifecycle GHG assessment. The only exception to this comprises the decommissioning stage, as the decommissioning or renewal of the infrastructure comprising the proposed scheme is not reasonably foreseeable. It is anticipated that whilst the proposed scheme has a design life in practice, it will be maintained beyond this timeframe and therefore including the GHG emissions associated with its demolition/ decommissioning is not realistic or relevant.

14.6.3. Potential GHG emission sources during the various lifecycle stages of the proposed scheme are detailed in Table 14.1.

**Table 14.1: Key GHG Emissions Sources**

Lifecycle Stage	Activity	Primary GHG Emission Sources
Pre-construction stage	Enabling works	Vehicles and fuel use for generators on site. Workers travelling to/ from the site. Loss of carbon sink.
Construction process stage (including materials)	Raw material extraction and manufacturing of products required for the proposed scheme <sup>40</sup> . On-site construction activity. Transport of construction materials (where not included in embodied GHG emissions). Transport of construction workers. Disposal of construction waste.	Embodied GHG emissions. GHG emissions from vehicle use. GHG emissions from disposal of waste.

<sup>40</sup> Excludes transport unless by exception – see construction process stage

<b>Operation stage</b>	Operation of associated road and signalling. Maintenance including re-surfacing.	GHG emissions from energy and fuel use. Embodied emissions associated with re-surfacing materials.
<b>Use stage</b>	Vehicle journeys	GHG emissions per vehicle km. Energy consumption.

### Climate Change Resilience

- 14.6.4. Climate change impacts are already impacting the reliability of local transport infrastructure; indeed, one of the stated objectives of the proposed scheme is to increase resilience and reliability of the network. Based on this, an assessment of climate change resilience is being conducted.
- 14.6.5. The Climate Change Strategy for Solihull (2009) summarises projected changes in the climate for the West Midlands region, and identifies transport as one of the key aspects in the region that will be affected by climate change. An example relevant to road infrastructure is higher temperatures in summer drying out soils, potentially leading to subsidence.
- 14.6.6. The proposed scheme itself may be vulnerable to a range of climate change risks. These include:
- Material deterioration due to high temperatures and also from periods of heavy rainfall;
  - Flood risk on the network and damage to drainage systems; and
  - Storm damage to structures and other assets.
- 14.6.7. Where the risk of climate change can be attributed to water events such as flooding, drainage provisions, to understand these risks, specific assessments for the water environment completed for the EIA will be drawn upon to inform the climate change and resilience assessment.

## 14.7. Design, Mitigation and Enhancement Measures

### GHG Impact Assessment

- 14.7.1. Mitigation is currently being considered as part of the proposed scheme design-development. As stated in the Fifth Assessment Report (AR5) Synthesis Report published by the Intergovernmental Panel on Climate Change (IPCC) (2014), mitigation (i.e. reducing GHG emissions) and adaptation (i.e. responding to climate change impacts) are complementary approaches to reducing risks of climate change impacts over different timescales.
- 14.7.2. Mitigation, in the short-term and medium-term, can substantially reduce climate change impacts in the latter decades of the 21st Century. Benefits from adaptation can be realised now to address current risks, and can be realised in the future to address emerging risks. Innovation and investments in environmentally sound infrastructure and technologies can both reduce GHG emissions and enhance resilience to climate change.
- 14.7.3. Mitigation measures as related to the proposed scheme are being identified with the aim of reducing GHG emissions across the various lifecycles of the proposed scheme. Mitigating measures being considered include:

- Construction activities would be undertaken by the appointed contractor in accordance with industry best practice, and in line with measures set out in their CEMP.
- Specification of alternative materials with lower embodied GHG emissions.
- Use of low carbon design specifications, such as energy-efficient lighting and durable construction materials to reduce maintenance and replacement cycles.

14.7.4. The selection of appropriate mitigation measures during construction and operation of the proposed scheme will be developed together with the proposed scheme design and confirmed in the ES.

#### **Climate Change**

14.7.5. A number of mitigation and adaptation measures are being considered to address proposed scheme potential climate resilience risks - this includes the inclusion of appropriate infrastructure and assets within the proposed scheme design (e.g. specification of a highway drainage system that takes account of climate change predictions).

### **14.8. Assessment of Effects**

#### **GHG Impact Assessment**

14.8.1. In line with the NPSNN, significance of GHG effects will be assessed by comparing estimated GHG emissions arising from the proposed scheme with UK Government carbon budgets, and associated reduction targets. The emissions assessment outcomes will also be put into context in terms of sector-specific carbon impacts by comparing estimated proposed scheme GHG emissions against other similar infrastructure schemes.

14.8.2. As the lifecycle GHG impact assessment is ongoing and feeding into the proposed scheme design, the likely significance of effects is in the process of being defined. The outcomes of the assessment will be reported in the ES.

#### **Climate Change Resilience**

14.8.3. As the climate change resilience impact assessment is ongoing and feeding into the proposed scheme design, the likely significance of effects on the proposed scheme in terms of vulnerability to climate change are in the process of being confirmed. The outcomes of the assessment will be reported in the ES.

## 15. ASSESSMENT OF CUMULATIVE EFFECTS

### 15.1. Cumulative Assessment Methodology

15.1.1. Cumulative effects are broadly defined as incremental effects that result from the accumulation of a number of individual effects, either caused by the proposed scheme (intra-project effects) or by other reasonably foreseeable developments which would be under construction at the same time as the proposed scheme or built later (inter-project effects).

15.1.2. The assessment of cumulative effects is ongoing and will consider the following:

- The combined effects from the proposed scheme on a single receptor from a number of individual environmental impacts, for example noise, dust and traffic (combined effects); and
- The effects of other developments in the vicinity of the proposed scheme which are under construction or have been consented, which when combined with the effects of the proposed scheme may have an incremental significant effect (cumulative effects).

15.1.3. The Planning Inspectorate's Advice Note 17<sup>41</sup> on the assessment of cumulative effects identifies a four stage approach to the assessment of cumulative effects, as follows:

- Stage 1: establish the project's zone of influence (ZOI) and identify a long-list of 'other development';
- Stage 2: identify a shortlist of 'other development' for the cumulative impact assessment;
- Stage 3: information gathering; and
- Stage 4: assessment.

15.1.4. Further details regarding the proposed methods being used to identify potentially significant combined and cumulative effects are set out in the M42 Junction 6 Improvement scheme EIA Scoping Report (AECOM, Nov 2017).

#### Proposed Zone of Influence (ZOI) for Environmental Topics Areas (Stage 1)

15.1.5. In accordance with the Planning Inspectorate's Advice Note 17, Table 15.1 outlines the proposed ZOI for each of the environmental topic areas covered within this PEI Report. This table is accompanied by Figure 15.1 which maps the proposed ZOIs.

**Table 15.1: ZOI Summary**

Environmental Topic	Zone of Influence (ZOI)
Air Quality	<p><b>Construction:</b> 200m ZOI from construction activities for construction dust and emissions.</p> <p><b>Operation:</b> The 'affected roads' define the ZOI (as described in Chapter 5: Air Quality). As the operational phase traffic data includes traffic associated with other developments, the air impact assessment to be included in the ES will inherently be a cumulative</p>

<sup>41</sup> Planning Inspectorate's Advice Note 17 (2015). Cumulative Effects Assessment Relevant to Nationally Significant Infrastructure Projects. <https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf>

	<p>impact assessment.</p> <p>Defined ZOI are in accordance with guidance given in Highway England's DMRB HA207/07. See Chapter 5: Air Quality for further information.</p>
Cultural Heritage	<p><b>Construction and Operation:</b> A 1km ZOI, which is the maximum extent used within the cultural heritage assessment. This ZOI is divided into the following:</p> <p>1km ZOI for designated assets; and,          500m ZOI for non-designated assets.</p> <p>The 1km ZOI is in accordance with the guidance on the Zone of Theoretical Visibility (ZTV) in DMRB Volume 11 Section 3 Part 5 (Annex III). See Chapter 6: Cultural Heritage for more details.</p>
Landscape and Visual Effects	<p><b>Construction and Operation:</b> 2km ZOI for landscape and visual impacts.</p> <p>A 2km ZOI is in accordance with the traveller's views study area which extends to the Visual Envelope (VE) as set out in Chapter 12: People and Communities. This exceeds the 1km study area used in Chapter 7: Landscape and Visual Effects. See Chapter 7: Landscape and Visual Effects and Chapter 12: People and Communities for more details.</p>
Biodiversity	<p><b>Construction and Operation:</b> A 2km ZOI in line with the desktop study which has been conducted for national statutory and non-statutory nature conservation designations.</p> <p>The defined ZOI is consistent with the study areas as defined for the biodiversity impact assessment - see Chapter 8: Biodiversity.</p>
Geology and Soils	<p><b>Construction and Operation:</b> ZOI covers all locations where physical works and ground disturbance would take place, plus a 250m buffer.</p> <p>The defined ZOI is consistent with the study areas as detailed in Chapter 9: Geology and Soils.</p>
Materials	<p><b>Construction:</b> The ZOI comprises the proposed scheme footprint and the region within which waste management facilities are located and from where construction materials may be sourced. The ZOI for materials during the construction phase is not shown on Figure 15.1 due to the difficulties with showing this study area graphically.</p> <p><b>Operation:</b> Operational phase waste management issues are scoped out of the assessment.</p> <p>The defined ZOI is consistent with the study areas as detailed in Chapter 10: Materials.</p>
Noise and Vibration	<p><b>Construction:</b> 1km ZOI around construction activities.</p> <p><b>Operation:</b> 1km ZOI for operational impacts (extends 1km from existing routes that would be improved or bypassed, and any proposed new routes, between the start and end points of the physical works associated with the proposed scheme). As the operational phase traffic data includes traffic associated with other</p>

	<p>developments, the noise and vibration impact assessment to be included in the ES will inherently be a cumulative impact assessment.</p> <p>The defined ZOIs are consistent with the study areas as defined for the noise impact assessment - see Chapter 11: Noise and Vibration.</p>
People and Communities	<p><b>Construction and Operation:</b> A 2km ZOI is defined which is the maximum ZOI used in the people and communities assessment as follows:</p> <p>500m ZOI for Non-Motorway User (NMU) facilities;</p> <p>2km ZOI for traveller's views (as set out by the Visual Envelope (VE) which is defined in DMRB Volume 11, Section 3, Part 5, Annex III).</p> <p>The defined ZOIs are consistent with the study areas as defined for the people and communities impact assessment - see Chapter 12: People and Communities.</p>
Road Drainage and the Water Environment	<p><b>Construction and Operation:</b> 1km ZOI for waterbodies (water bodies located outside the ZOI, but immediately within its surrounds, have been included where it appears that there is hydraulic connectivity to features within the ZOI and the possibility that they could be significantly affected.) and flood risk. For groundwater bodies, the ZOI is the potential zone of impact.</p> <p>The defined ZOIs are consistent with the study areas as defined for the water environment impact assessment - see Chapter 13: Road Drainage and the Water Environment.</p>
Climate	<p><b>Construction and Operation:</b> The ZOI covers all GHG emissions arising during proposed scheme construction and operation.</p> <p>The defined ZOI is consistent with the study area as defined for the climate assessment - see Chapter 14: Climate.</p>

## 15.2. Assessment of Effects

### Assessment of Combined Effects

15.2.1. The main source of data for the intra-project combined effects assessment will be the outcomes and information obtained from the individual environmental topic assessments, which are currently ongoing as reported within the individual topic chapters of this PEI Report. It is currently anticipated that the following intra-project combined effects may occur, although it should be noted that these are indicative at this stage of the assessment:

- Combined dust, noise and visual impacts upon receptors in close proximity to the construction areas (which may also experience severance/ access issues due to construction vehicle movements).

15.2.2. Mitigation and avoidance measures are currently being considered with the aim of reducing such impacts and the overall potential for combined effects. The potential for combined effects will be reported in the ES, following completion of the individual environmental topic assessments.

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### **Assessment of Cumulative Effects**

- 15.2.3. The assessment of cumulative effects arising from the proposed scheme in combination with other proposed schemes (inter-project effects) is based upon a review of current planning applications, as well as a study of planning and policy documents. The assessment is currently focussed on the identification of relevant developments and land allocations within the defined ZOIs (see Figure 15.1) which have the potential to generate potentially significant cumulative effects. Details of developments are currently being collated and placed on an initial long-list which identifies the size, type and location of each development. These long-list developments are being reviewed to assess their potential temporal and spatial interactions with the proposed scheme in order to identify whether they should be scoped into the cumulative assessment – initial results from the short-listing exercise are detailed below.
- 15.2.4. Relevant developments, based on their likelihood and potential traffic contributions, are being included within the proposed scheme traffic model. The traffic model will be used to inform the individual topic chapters which take account of proposed scheme changes to traffic flow (e.g. air quality and noise). Thus the operational phase air and noise impact assessment which will be reported in the ES will inherently be cumulative impact assessments.
- 15.2.5. Consideration is also being given to the inclusion of other Highways England schemes as part of the cumulative effects assessment. However, it should be noted that schemes which will have a preferred route announcement before the application has been submitted for the proposed scheme will be included as part of the baseline (i.e. it is assumed that they will be operational before the proposed scheme), and therefore will not be included in the cumulative effects assessment for the operational phase. The assessment will, however, take account of potential cumulative impacts which may occur during the applicable construction phase, based on anticipated construction timescales.

### **Short-listed Developments – Initial Stage 2 Findings**

- 15.2.6. Based on a preliminary review of the current long-list of potential developments within defined ZOIs, the following are considered to have the potential to generate cumulative effects with the proposed scheme (based on their temporal scope and/or scale and nature):
- Extra motorway service area (MSA) site;
  - High Speed 2 (HS2) main line;
  - HS2 Birmingham International Station;
  - Airport NEC Integrated Transport Access Regional Infrastructure Fund (ANITA RFA) - public transport improvements project;
  - A45 Transport Corridor Regional Growth Fund;
  - Birmingham Airport Runway Extension (2008);
  - Sand and gravel extraction and processing site, north-east of M42 Junction 6; and
  - Jaguar Land Rover expansion plans, Damson Parkway.
- 15.2.7. It should be noted, however, that the long-list is still being reviewed and hence further developments may be scoped into the assessment.



### **15.3. Next Steps**

- 15.3.1. The initial long-list will be further collated and refined, aided by consultation with the relevant local planning authorities.
- 15.3.2. At Stage 2, any developments considered to have the potential to cause cumulative effects with the proposed scheme will be identified and placed on the short list. This process is ongoing and will be undertaken with input from the local planning authorities and the environmental topic specialists.
- 15.3.3. Stage 3 will involve the collation of information relating to the short-listed schemes, including their design and location, programme for construction/ operation and demolition, and any environmental assessments carried out.
- 15.3.4. Stage 4 involves the assessment and identification of potentially significant cumulative effects – this stage will be undertaken and reported in the ES.

## 16. GLOSSARY AND ABBREVIATIONS

### 16.1. Glossary

Term	Abbreviation	Definition
Above Ordnance Datum	AOD	Above the mean sea level at Newlyn in Cornwall calculated between 1915 and 1921, taken as a reference point for the height data on Ordnance Survey maps.
Affected Road Network	ARN	Parts of the road network which are identified as likely to be affected by changes in air quality as a result of a development project.
Aggregate		Granular material (e.g. sand and gravel or crushed rock) that can be used for building and/or civil engineering purposes (e.g. for concrete production).
Agricultural handback		The returning of earthwork slopes to full agricultural use.
Agricultural Land Classification	ALC	The system devised and introduced by the Ministry of Agriculture, Fisheries and Food to classify agricultural land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. Land is graded between 1 (excellent quality) to 5 (very poor quality), with grade 3 subdivided into agricultural subgrades 3a and 3b.
Air quality action plan		A plan that must be compiled by a local authority if they declare an air quality management area.
Air quality exceedance		Where pollutant concentrations exceed an air quality standard.
Air quality limit value		A maximum pollutant concentration to be achieved in the atmosphere, either without exception or with a permitted number of exceedances. Limit values are defined in European Union Directives and implemented in United Kingdom legislation.
Air Quality Management Area	AQMA	If a local authority identifies any locations within its boundaries where the air quality objectives are not likely to be achieved, it must declare the area as an air quality management area. The local authority is subsequently required to put together a local air quality action plan.
Air quality objective		Objectives are policy targets generally expressed as a maximum ambient pollutant concentration to be achieved. The objectives are set out in the UK Government's Air Quality Strategy for the key air pollutants.
Alluvial deposits		Natural materials deposited within and adjacent to rivers.
Ambient noise		A sound that is totally encompassing in a given situation at a given time usually composed of sound from many sources near and far.

Amenity		The benefits of enjoyment and well-being which are gained from a resource in line with its intended function. Amenity may be affected by a combination of factors such as: sound, noise and vibration; dust/air quality; traffic/congestion; and visual impacts.
Ancient Woodland		Land that has been continually wooded since at least the year 1600AD.
Annual Average Daily Traffic	AADT	The total volume of vehicle traffic on a road flowing past a certain point over a year, divided by 365 days.
Annual Average Weekday Traffic	AAWT	The average 24-hour traffic volume occurring on weekdays throughout a full year.
Annual Exceedance Probability	AEP	Flood frequency is expressed in terms of an annual exceedance probability, which is the inverse of the annual maximum return period. For example, the 100-year flood (a flood likely to occur once every 100 years) can be expressed as the 1% AEP flood, which has a 1% chance of being exceeded in any year.
Appropriate Assessment		An assessment of the effects of a plan or project on the Natura 2000 network of European sites of nature conservation significance. The assessment focuses on the plan or project's implications for the site and any potential adverse impacts on its integrity.
Aquifer		A geological formation that is sufficiently porous and permeable as to store and yield a significant quantity of water to a borehole, well or spring.
Assemblage		A group of species found in the same location.
At-grade		On the same level. For example, when a road is on the current ground level.
Attenuation pond		See balancing pond.
Balancing pond		Part of a drainage system that is used for temporarily storing and attenuating flood waters. Also referred to as an Attenuation pond.
Baseline conditions		The environment as it appears (or would appear) immediately prior to the implementation of the project together with any known or foreseeable future changes that will take place before completion of the project.
Basic Noise Level	BNL	A measure of source noise at a reference distance of 10m from the nearside carriageway edge.
Bedrock		Rock that underlies loose deposits such as soil or alluvium.
Best and most versatile land	BMVL	Land defined as grades 1, 2 and 3a of the Agricultural Land Classification. This land is considered the most flexible, productive and efficient and is most capable of delivering crops for food and non-food uses.

Below ground level	BGL	Term used to differentiate below ground from above ground.
Biodiversity		The variety of life in the world or in a particular habitat or ecosystem.
Borehole		A hole bored into the ground, usually as part of investigations, typically to test the depth and quality of soil, rock and groundwater. A borehole can also be used to dewater the ground.
British Geological Survey	BGS	A body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research
British Standard	BS	Standard produced by the British Standards Institution.
British Standards Institution	BSI	A group which produces British Standards across industry sectors and which is formally designated as the National Standards Body for the UK.
Buffer		Specified area or distance surrounding a site or feature of interest.
Built heritage		A structure or building of historic value. These structures are visible above ground level.
Bund		An embankment which acts as a visual or noise screen, or acts as a barrier to control the spillage of fluids.
Buried archaeology (or buried heritage)		An archaeological asset beneath ground level, which may include earthworks.
Calculation of Road Traffic Noise	CRTN	A technical memorandum that describes the procedures for calculating noise from road traffic.
Carbon monoxide		A pollutant gas generated by combustion sources. At very high concentrations it can be a dangerous asphyxiant.
Carbon footprint		The total greenhouse gas emissions associated with a particular policy or development.
Carriageway		The width of a highway that can be used by motorised vehicles and non-motorised users.
Catchment		A drainage/basin area within which precipitation drains into a river system and eventually into the sea.
Chartered Environmentalist	CEnv	A professional qualification obtained by knowledgeable, experienced, competent and committed environmental professionals.
Circa	c.	Meaning approximately, often used in a historic context in reference to a date.
Clay		An inorganic component of soil derived from the weathering of rock and comprising particles less than 0.002mm in equivalent diameter.
Climate		The climate can be described simply as the 'average weather', typically looked at over a period of 30 years. It can include temperature, rainfall, snow cover, or any other weather characteristic.

Climate change		This refers to a change in the state of the climate, which can be identified by changes in average climate characteristics which persist for an extended period, typically decades or longer.
Committed development		A development that has full or outline planning permission, or is allocated in an adopted development plan.
Conceptual Site Model		Method used to manage identification of the various types of risk relating to contaminated land. The conceptual site model includes: categorisation of sources of contamination; categorisation of potential receptors; and identification of potential contamination pathways (i.e. linking sources to receptors).
Conservation Area	CA	An area designated under section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990 as being of special architectural or historic interest and with a character or appearance which is desirable to preserve or enhance.
Connectivity		A measure of the availability of the habitats needed for a particular species to move through a given area.
Conservation status		The state of a species or habitat including for example, extent, abundance, distribution and their trends.
Construction plant		Portable construction machinery and equipment.
Controlled waters		Rivers, streams, estuaries, lakes, canals, ditches, ponds and groundwater as far out as the UK territorial limit. The statutory definition is provided in section 104 (1) of the Water Resources Act 1991 and section 30A (d) of the Control of Pollution Act 1974.
Construction Environmental Management Plan	CEMP	A plan prepared by a contractor which sets out how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area and the protocols to be followed in implementing these measures, in accordance with environmental commitments.
Culvert		A tunnel (pipe or box shaped) that carries a stream or open drain under a road or railway.
Cumulative impact (or effect)		A cumulative impact (or effect) may arise as the result of: a) the combined impact of a number of different environmental topic-specific impacts from a single environmental impact assessment project on a single receptor/resource; and b) the combined impact of a number of different projects within the vicinity (in combination with the environmental impact assessment project) on a single receptor/resource.
Cutting (road)		Excavation of earth material to lower the ground level on which a road would be positioned, in order to help to reduce noise and/or visual impact.

Decibel	dB	The scale used to measure noise is the decibel scale which extends from 0 to 140 decibels, corresponding to the intensity of the sound pressure level.
Decision-maker		The Secretary of State (in England).
Definitive Map		A record of Public Rights of Way in England and Wales, maintained by local authorities.
Department for Environment, Foods & Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Delay		For pedestrians, this is the increase in the 'person-minutes' of the journey times of pedestrians and other non-motorised travellers. For traffic, this is the increase in journey times for drivers and passengers.
Deposition (dust)		The vertical passage of a substance (e.g. dust) to a surface or the ground.
Deposition (sediment)		The laying down of part, or all, of the sediment load of a stream on the bed, banks or floodplain which forms various sediment features such as bars, berms and floodplain deposits.
Design-development		The process in which technical specialists (engineers and environmentalists) refine the design for the various elements of the proposed scheme.
Design Manual for Roads and Bridges	DMRB	A set of documents that provide a comprehensive manual system which accommodates all current standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads (including motorways).
Detailed assessment		Method applied to gain an in-depth appreciation of the beneficial and adverse consequences of the project and to inform project decisions. Detailed Assessments are likely to require detailed field surveys and/or quantified modelling techniques.
Determination		The formal judgement as to whether a project requires statutory Environmental Impact Assessment or not.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Development plan		Documentation which seeks to guide development and planning in a local authority area for a set period of time.
Diffusion tube		Passive devices used in air quality monitoring to measure weekly or monthly average pollutant concentrations.
Directive		Legal obligations imposed on European member states by the European Union.
Displacement		Loss of local economic activity as a direct consequence of a proposed development.

Do Minimum		The conditions that would persist in the absence of the implementation of a construction or improvement project, but given that maintenance is ongoing.
Do Something		The conditions that would occur as a consequence the implementation of a construction or improvement project.
Drift geology		Materials of glacial origin including sediments and large rocks derived from erosion, transportation and deposition by glaciers.
Driver stress		The adverse mental and physiological effects experienced by a driver traversing a road network. Factors influencing the level of stress include road layout and geometry, surface riding characteristics, junction frequency, and speed and flow.
Dust		All airborne particulate matter.
Earthworks		The removal or placement of soils and rocks such as in cuttings, embankments and environmental mitigation, including the in-situ improvement of soils/rocks to achieve the desired properties.
Ecological potential		Surface waters identified as Heavily Modified Water Bodies or Artificial Water Bodies must achieve 'good ecological potential' (good potential is a recognition that changes to morphology could make Good Ecological Status very difficult to achieve).
Ecological status		The state of a water body, derived from a number of factors, including: the abundance of aquatic flora and fauna, nutrient availability, salinity, temperature and chemical pollution levels.
Ecosite		A non-statutory ecological designated site.
Ecosystem		Biological community of interacting organisms (e.g. plants and animals) and their environment.
Effect		Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Directive		Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment
EIA Regulations		The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Elements		Individual parts which make up the landscape, such as trees, hedges and buildings.
Embankment		Artificially raised ground, commonly made of earth material, such as stone, on which the carriageway is laid.

Enhancement		A measure that is over and above what is required to mitigate the adverse effects of a project.
Envirocheck		A provider of environmental data, reports and risk solutions for use in site-based assessments.
Environment Agency	EA	Government agency established to protect and improve the environment and contribute to sustainable development in England. Responsibilities include: water quality and resources, flooding and coastal risk management and contaminated land.
Environmental assessment		A method and process by which information about environmental effects is collected, assessed and used to inform decision-making.
Environmental Health Officer	EHO	A local authority officer with responsibilities for protecting public health through the administration and enforcement of environmental health legislation.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Erosion		The removal of sediment or bedrock from the bed or banks of a channel by flowing water occurring mostly during high flows and flood events. Forms various river features such as scour holes and steep outer banks.
European site		The generic term used to describe the following designated sites: <ul style="list-style-type: none"> <li>• Special Areas of Conservation (SACs) and Special Protection Areas (SPAs);</li> <li>• Sites that are in the process of designation as SACs and SPAs -these are known as proposed SACs (pSACs), candidate SACs (cSACs), potential SPAs (pSPAs) and Sites of Community Importance (SCIs), depending on the type of designation and point of progression through the designation process; and</li> <li>• Ramsar Sites.</li> </ul>
Evaluation		The determination of the significance of effects. Evaluation involves making judgements as to the value of the receptor/resource that is being affected and the consequences of the effect on the receptor/resource based on the magnitude of the impact.
Excavated material		Largely natural soil and rock material that is removed from the ground during construction.
Exchange land		Mitigation land which is not smaller in area and is equally advantageous to the users of land taken by a development project.



Farm Viability Assessment		An assessment which establishes the current operational and economic conditions of agricultural businesses and how a development project could affect their future viability.
Fill		Material used to artificially raise the existing ground levels.
Find spot		A term used to describe the location at which an archaeological find was discovered.
Flood Consequence Assessment		The process of assessing potential flood risk to a site and identifying whether there are any flooding or surface water management issues that may warrant further consideration or may affect the feasibility of a development.
Flood Zones 1, 2 and 3		A flood zone area classification system devised by the Environment Agency: <ul style="list-style-type: none"> <li>• Flood Zone 1: land outside the floodplain. There is little or no risk of flooding in this zone;</li> <li>• Flood Zone 2: the area of the floodplain where there is a low to medium flood risk; and</li> <li>• Flood Zone 3: the area of the floodplain where there is a high risk of flooding.</li> </ul>
Floodplain		Land adjacent to a watercourse over which water flows or would flow in times of flood, but for defences in place.
Fluvial		A term that relates to rivers and streams and the processes that occur within them.
Formation (geological)		A group of related rock strata with some common properties.
Fragmentation (ecological)		The breaking up of a habitat, ecosystem or land use types into smaller parcels.
Future baseline		The situation that would prevail should a proposed development not proceed. Predicted impacts are compared against this theoretical scenario.
Gaelic Athletic Association	GAA	Ireland's largest sporting association responsible for promoting Gaelic games such as hurling, football, handball and rounders.
Geomorphology		The study of landforms and the processes which create them.
Geophysical survey		A process involving ground-based physical sensing techniques to determine the presence or absence of anomalies likely to be caused by archaeological features, structures or deposits.
Green Belt		A designation for land around certain cities and large built-up areas, which aims to keep this land permanently open or largely undeveloped.

Greenhouse gases	GHG	Atmospheric gases such as carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, ozone, and water vapour that absorb and emit infrared radiation emitted by the Earth's surface, the atmosphere and clouds.
Ground-borne vibration		Vibration generated by an event such as the pass-by vehicles in a tunnel, propagated through the ground or structure (i.e. not the air) into a receiving building.
Ground investigation		An intrusive investigation undertaken to collect information relating to the ground conditions, normally for geotechnical or land contamination purposes.
Groundwater		All water which is below the surface of the ground and within the permanently saturated zone.
Groundwater source protection zone		Areas defined by the Environment Agency which show the risk from contamination/pollution to groundwater that is extracted for drinking water.
Habitat		The natural home or environment of an animal, plant, or other organism.
Habitat of principal importance	HPI	Habitats in England identified as requiring action in the UK Biodiversity Action Plan and which are regarded as having biodiversity conservation priorities.
Handover Environmental Management Plan	HEMP	A package of information that is handed over to those responsible for the future management and operation of the highway.
Hardcode		Material used for infill e.g. broken bricks, stone or concrete which are hard, inert and don't readily deteriorate or absorb water. Often used to raise land levels and serve as a solid base for building.
Haul road		A temporary road provided within a contractor's site area to allow for the movement of construction material, construction machinery and/or construction labour around the site.
Highways Agency Water Risk Assessment Tool	HAWRAT	A spreadsheet based application used to determine whether highway runoff is likely to have an ecological impact on surface watercourses.
Heavy Duty Vehicle		See Heavy Goods Vehicle.
Heavy Goods Vehicle	HGV	A commercial carrier vehicle with a gross vehicle weight of more than 3.5 tonnes.
Hectare	ha	A metric unit of measurement, equal to 2.471 acres or 10,000 square metres.
Heritage asset		A building, monument, site, place, area or landscape of historic value.

Historic England		Executive non-departmental public body created under section 32 of the National Heritage Act 1983 to: a) secure the preservation of ancient monuments and historic buildings situated in England; b) promote the preservation and enhancement of the character and appearance of conservation areas situated in England; and c) promote the public's enjoyment of, and advance their knowledge of, ancient monuments and historic buildings situated in England and their preservation.
Historic Environmental Record	HER	A record of all known archaeological finds and features and historic buildings and historic /landscape features, relating to all periods from the earliest human activity to the present day; maintained by each County and Unitary Authority in the United Kingdom.
Hoarding		A temporary fence erected around a construction site.
Hydrogeology		The nature, distribution and movement of groundwater in soils and rocks, including in aquifers.
Glacial deposit		Natural materials laid down during the ice ages (Quaternary period).
High Speed 2	HS2	A planned high-speed railway which will link London to Birmingham, the East Midlands, Leeds and Manchester.
Impact		Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Important hedgerow		A hedgerow that is at least 30 years old and which meets certain criteria relating to its particular archaeological, historical, wildlife and landscape value.
In-combination effects		In-combination effects arise where community or business establishments are affected by a combination of a number of environmental effects (for example, from sound, noise and vibration; dust and air quality).
In-situ preservation (cultural heritage)		Preserving archaeological remains in their original position.
Inert waste		Defined in Article 2(e) of EU Landfill Directive (1999/31/EC) as waste that does not undergo any significant physical, chemical or biological transformations: <ul style="list-style-type: none"> <li>• inert waste does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and</li> <li>• the total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water and/or groundwater.</li> </ul>

Institute of Air Quality Management		The professional body for air quality practitioners.
Interim Advice Note	IAN	Guidance notes issued by Highways England which incorporate amendments or additions to the Design Manual for Roads and Bridges.
Invasive species		Non-native UK plants that are invasive, for example Japanese Knotweed.
Key characteristics (landscape)		The combination of elements that are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
Landscape character area	LCA	Areas of landscape that have a broadly consistent pattern of topography, land use and vegetation cover.
Land use		What land is used for, based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
Landform		The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
Laydown area		An area used for the temporary storage of construction equipment and supplies.
Light goods vehicle		A motor vehicle used to carry goods with a total mass of up to 3.5 tonnes.
Link (road)		A section of road between two junctions.
Listed building		A building of special architectural or historic interest. Listed buildings are graded I, II* or II, with Grade I being the highest. Listing includes the interior as well as the exterior of the building.
Local Biodiversity Action Plan	LBAP	A plan that identifies threatened species and habitats and seeks to protect and restore biological systems.
Local planning authority		The local authority or council that is empowered by law to exercise planning functions.
Local Geological Site	LGS	Non-statutory geological sites considered worthy of protection for their earth science or landscape importance. Formerly known as Regionally Important Geological Sites.
Local wildlife site	LWS	Non-statutory sites of nature conservation value that have been designated 'locally'. These sites are referred to differently between counties with common terms including site of importance for nature conservation, county wildlife site, site of biological importance, site of local importance and sites of metropolitan importance.

Made ground		Land where natural and undisturbed soils have largely been replaced by man-made or artificial materials. It may be composed of a variety of materials including imported natural soils and rocks with or without residues of industrial processes (such as ash) or demolition material (such as crushed brick or concrete).
Multi-Agency Geographic Information Service	MAGIC	A UK government website which provides geographic information about the natural environment.
Main River		A river maintained directly by the Environment Agency. They are generally larger arterial watercourses.
Metapopulation		A group of spatially separated populations of the same species which interact at some level.
Mitigation		Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects.
Micron	µm	One millionth of a metre.
Microgram	µg	One millionth of a gram.
Monitoring		A continuing assessment of the performance of the project, including mitigation measures. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted.
Motorway Service Area	MSA	Motorway facilities where drivers can stop to use welfare facilities, refuel the vehicles, rest, eat and drink.
Mineral safeguarding areas		Areas defined by mineral planning authorities with known mineral resources that are of identified economic or conservation value.
National Character Area		Areas of England defined by their unique combination of landscape, biodiversity, geodiversity, history and cultural an economic activity.
National Cycle Network		A national cycling route network of the United Kingdom, which was established to encourage cycling throughout Britain, as well as for the purposes of bicycle touring.
National Policy Statement	NPS	Statements prepared and designated by the Secretary of State under the Planning Act 2008, which establish national policy for Nationally Significant Infrastructure Projects, including energy, transport and water, waste water and waste and against which applications for Development Consent Orders are assessed.
National Policy Statement for National Networks	NPSNN	A statement setting out the need for, and Government's policies to deliver, the development of nationally significant infrastructure projects on the national road and rail networks in England.
National Vegetation Classification	NVC	A comprehensive classification and description of the plant communities of Britain, administered by the Joint Nature Conservation Committee.

Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Natura 2000		A network of core breeding and resting sites for rare and threatened species, and some rare natural habitat types which are protected in their own right.
Natural England		Executive non-departmental public body constituted under the Natural Environment and Rural Communities Act 2006 (section 2(1)) to ensure that the natural environment is conserved, enhanced and managed for the benefit of present and future generations, thereby contributing to sustainable development.
National Exhibition Centre	NEC	A venue in Birmingham used for large scale events and exhibitions, located near Junction 6 of the M42.
Nitrate vulnerable zone		Areas covering 62% of England designated as a result of the EU's Nitrates Directive in order to reduce the level of nitrates in surface and groundwater. Farmers with land in nitrate vulnerable zones have to follow mandatory rules to tackle nitrate loss from agriculture.
Nitrogen dioxide	NO <sub>2</sub>	A gas produced when fuels are burned and is often present in motor vehicle and boiler exhaust fumes. It is an irritant to the respiratory system.
Nitrogen oxides	NO <sub>x</sub>	A group of chemical compounds consisting only of nitrogen and oxygen which may be interconverted in the atmosphere. The principal oxides of nitrogen are nitric oxide and nitrogen dioxide.
Noise barrier (or attenuation barrier)		A solid construction that reduces unwanted sound. It may take many forms including: engineering cutting; retaining wall; noise fence barrier; landscape earthworks; a 'low level' barrier on a viaduct; a parapet barrier on a viaduct; or any combination of these measures.
Noise Important Area	NIA	Are identified with respect to noise from major roads and from roads within agglomerations where 'the 1% of the population that are affected by the highest noise levels from major roads' are located according to the results of the strategic noise mapping.
Noise Sensitive Receptor	NSA	These comprise mainly residential buildings, but also include educational buildings, hospitals and places of worship.
Non-hazardous waste		Any waste not defined as 'hazardous' under Directive 91/689/EEC. Examples include soils from ground/site clearance and demolition wastes.
Non-motorised users	NMU	A collective term used to describe pedestrians, cyclists and equestrians (horse riders).

Non-Technical Summary	NTS	Information for the non-specialist reader to enable them to understand the main predicted environmental effects of the proposal without reference to the main Environmental Statement.
Operational		The functioning of a project on completion of construction.
Ordnance Survey	OS	The national mapping agency for the UK.
Outline Construction Environmental Management Plan		A framework document which sets out the matters that the contractor will need to include in their Construction Environmental Management Plan.
Overbridge		A bridge crossing over a transport corridor (e.g. a highway).
Particulate matter	PM <sub>10</sub> or PM <sub>2.5</sub>	Discrete particles in ambient air, with diameters ranging between nanometres (billionths of a metre) to micrometres (millionths of a metre).
Pathways		The routes by which pollutants are transmitted through air, water, soils, plants and organisms to their receptors.
Phase 1 habitat survey		A habitat classification and field survey technique to record semi-natural vegetation and other wildlife habitats.
Photomontage		Inserting an image of a proposed development onto a photograph for the purposes of creating an illustrative representation of potential changes to existing views.
Planning Act 2008	PA 2008	An Act of Parliament in the UK intended to accelerate the process of approving major new infrastructure projects.
Pollution prevention guidance		A series of guidance notes produced by the Environment Agency to advise industry and the public on legal responsibilities and good environmental practice.
Potential Local Wildlife Site	pLWS	An area being considered against defined nature conservation value criteria. This criteria takes into account the most important, distinctive and threatened species and habitats. If considered suitable pLWS are confirmed as LWS. See LWS.
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant, and is reasonably required to assess the environmental effects of a development project.
Preferred option		The chosen design option that most successfully achieves the project objectives and becomes subject to further design and assessment.
Preferred Route Announcement	PRA	An announcement made by Highways England following the selection of a preferred option or solution for a given road project.
Project Control Framework	PCF	A joint Department for Transport and Highways England approach to developing, delivering and managing major road projects.
Proposed scheme		The M42 Junction 6 Improvement Scheme.

Public right of way	PRoW	A highway where the public has the right to walk. It can be a footpath (used for walking), a bridleway (used for walking, riding a horse and cycling), or a byway that is open to all traffic (include motor vehicles).
Ramsar (site)		Wetland sites that are of international importance, as designated under Article 2(1) of the Convention on Wetlands of International Importance especially as Waterfowl Habitat. Ramsar (Iran), 2 February 1971. UN Treaty Series No. 14583.
Receptor		A defined individual environmental feature usually associated with population, fauna and flora that has potential to be affected by a project.
Regionally Important Geological Sites	RIGS	Locally designated sites of importance for geodiversity.
Register of Historic Battlefields		Historic England's non-statutory register which identifies important English battlefields. Its purpose is to offer them protection and to encourage a greater understanding of their significance.
Register of Historic Parks and Gardens		Historic England's non-statutory register which identifies over 1,600 sites of historic interest in England assessed to be of national importance. Its purpose is to offer them protection and to encourage a greater understanding of their significance.
Remediation		The process of removing a pollution linkage (i.e. by removing one or more of the elements in a source-pathway-receptor linkage) in contaminated land in order to render an acceptable risk. Usually this involves a degree of removal of contaminants and/ or blockage of pathways.
Resource		A defined but generally collective environmental feature usually associated with soil, water, air, climatic factors, landscape, material assets, including the architectural and archaeological heritage that has potential to be affected by a project.
Restoration (ecological)		The re-establishment of a damaged or degraded system or habitat to a level similar to its original condition.
Road Investment Strategy	RIS	A document which sets out a long-term vision for England's motorways and major roads, outlining how smooth, smart and sustainable roads will be achieved through investment over a five year period (2015 – 2020).
Risk assessment		An assessment of the probability of a hazard occurring that could result in an impact.
Runoff		The flow of water over the ground surface.



Sand		Soil particles from 0.06mm-2.0mm in equivalent diameter. Fine sand particles are from 0.06mm-0.2mm; medium sand from 0.2mm-0.6mm; and coarse sand from 0.6mm-2.0mm.
Scheduled Monument	SM	Nationally significant heritage assets protected by the 1979 Ancient Monuments and Archaeological Areas Act.
Scoping		The process of identifying the issues to be addressed by the Environmental Impact Assessment process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered to be not significant.
Scoping Opinion		A written opinion of the relevant authority, following a request from the applicant for planning permission, as to the information to be provided in an Environmental Statement.
Screening		The formal process undertaken to determine whether it is necessary to carry out a statutory Environmental Impact Assessment and publish an Environmental Statement in accordance with the EIA Regulations.
Secondary aquifer		There are two types of secondary aquifer designations: <ul style="list-style-type: none"> <li>• Secondary A: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers; and</li> <li>• Secondary B: predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.</li> </ul>
Secretary of State	SoS	The cabinet minister who (among other things) ultimately determines applications for Development Consent Orders.
Sediment		Organic and inorganic material that has precipitated from water to accumulate on the floor of a water body, watercourse or trap.
Setting (cultural heritage)		The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive, negative or neutral contribution to the significance of an asset and may affect the ability to appreciate it.
Severance (non-motorised users)		The perceived separation of residents from facilities and services they use within their community caused by new or improved roads, or by changes in traffic flows.

Severance (land)		The splitting of a land holding into more than one part, for example through the introduction of a new section of road.
Side Road Network		The network of minor roads which connect to busier or more important road.
Significance (of effect)		A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.
Silt		Soil particles from 0.002mm to less than 0.06mm in equivalent diameter.
Simple Assessment		Initial, brief assessment activity based on the assembly of data and information that is readily available, to fulfil one of the following functions: <ul style="list-style-type: none"> <li>• To address unknown aspects in the Scoping assessment level;</li> <li>• To reach an understanding of the likely environmental effects to inform the final design and assessment; or,</li> <li>• To reach an understanding of the likely environmental effects that identifies the need for a Detailed Assessment.</li> </ul>
Site of Biological Importance		A non-statutory designation used by some local planning authorities to protect locally valued sites of biological diversity described as local wildlife sites by the UK Government.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features.
Site Waste Management Plan	SWMP	A plan that is used to outline how a construction project will avoid, minimise or mitigate effects on waste production and handling on the environment and surrounding area.
Site-won		Material derived from a construction site rather than being imported.
Soil		The upper layer of the earth's crust, in which plants grow. It consists of weathered rock, organic matter, air spaces and water. Descriptions usually identify the relevant characteristics of its (usually) horizontal layers in terms of their significance for soil characteristics and crop growth, usually to a depth of 1.2m.
Soil compaction		The removal of pore spaces within soil structures and drainage channels between soil structures. This inhibits root penetration and the movement of air and water in soil.
Soil erosion		The detachment and movement of soil by the action of water and/or wind.

Soil resource		The textures, structures and volume of different qualities of topsoil and subsoil that have a potential for beneficial reuse.
Solihull Metropolitan Borough Council	SMBC	The local authority within whose jurisdiction the proposed scheme would be implemented
Sound power level		The sound power level of a source is a measurement of the total acoustic power it radiates. The sound power level is an intrinsic characteristic of a source (analogous to its volume or mass), which is not affected by the environment within which the source is located.
Sound pressure level		The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Span		The horizontal distance between two supports of a structure (e.g. piers of a bridge or viaduct).
Stakeholder		An organisation or individual with a particular interest in a development project.
Statutory consultee		Organisations that the relevant determining authority is required to consult by virtue of the EIA Regulations
Strategic Road Network	SRN	Motorways and major trunk roads in England.
Study area		The spatial area within which environmental effects are assessed (i.e. extending a distance from the project footprint in which significant environmental effects are anticipated to occur).
Subsoil		Weathered soil layer extending between the natural topsoil and the unweathered basal layer (geological parent material) below, or similar material on which topsoil can be spread. Subsoil has lower organic matter and plant nutrient content than topsoil. In most cases topsoils require a subsoil to perform one or a number of natural soil functions.
Sulphur dioxide		A gas primarily arising from anthropogenic activities and more specifically combustion of fuels containing sulphur and sulphur compounds. Sulphur dioxide is emitted in negligible quantities during the combustion of natural gas but generally at higher concentrations for liquid fuels which have a higher sulphur content.

Superficial deposit		A geological deposit that was laid down during the Quaternary period. Such deposits were largely formed by river, marine or glacial processes but can also include wind-blown deposits known as loess.
Surface water		Waters including rivers, lakes, loughs, reservoirs, canals, streams, ditches, coastal waters and estuaries.
Sustainable drainage systems	SuDS	Measures designed to control surface runoff close to its source, including management practices and control measures such as storage tanks, basins, swales, ponds and lakes. Sustainable drainage systems allow a gradual release of water and thereby reduce the potential for downstream flooding.
Till		Unsorted glacial sediment deposited directly by a glacier.
Topsoil		Upper layer of a soil profile, usually darker in colour (because of its higher organic matter content) and more fertile than subsoil, and which is a product of natural biological and environmental processes.
Trackout		The transportation of dust and dirt from construction sites onto the road network by heavy duty vehicles.
Translocation		Transporting and release of species or habitats from one location to another. For example, if an area of land is required permanently for a new development, species can be moved from that site to a suitable alternative location.
Tree Preservation Order	TPO	An order made by a local planning authority, under the Town and Country Planning Act 1990, in respect of trees or woodlands. The principal effect of a tree preservation order is to prohibit the cutting down, uprooting, topping, lopping, wilful damage or wilful destruction of trees without the local planning authority's consent.
Trial trenching (cultural heritage)		A method of on-site archaeological investigation where trenches are dug at intervals across a site to identify any archaeological remains.
Two-way trips		A person trip is a one-way journey by one person by any mode of transport, including walking, cycling, privately operated motor vehicles, or any public transport modes. A vehicle trip is a one-way journey by a single privately-operated motor vehicle regardless of the number of persons in the vehicle. Two-way trips refer to the total number of vehicle movements in both directions (i.e. with 200 westbound vehicles and 100 eastbound, there would be 300 two-way trips)
Underbridge		A bridge crossing under a transport corridor (e.g. a highway).
Unitary Development Plan	UDP	A statutory document that sets out the council's planning policies for development, conservation, regeneration and environmental improvement activity.

Unexploded ordnance		Explosives that did not explode when deployed and thus still pose a risk of detonation.
Unproductive strata		Layers of rock or superficial deposits with low permeability or porosity that have a negligible significance for water supply.
Vehicle movement		A journey made by a vehicle. This can either be a one way or two way trip.
Viewpoint		A place from which something can be viewed.
VISSIM		A type of computer simulation software used in transportation assessments to model how traffic would interact on a given area of the road network.
Visual amenity		The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area.
Visual receptor		People who may have a view of a proposed development during construction or operation.
Wetness class		Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six wetness classes are identified, ranging from 'very well drained' to 'very poorly drained'.
Warwickshire Biological Records Centre	WBRC	Database records for ecological species and sites in Warwickshire.
Zone of Influence	ZOI	The temporal and spatial influence of a development project.
Zone of theoretical visibility	ZTV	The likely (or theoretical) extent of visibility of a development, usually shown on a map.

## 16.2. Abbreviations

AADT	Annual Average Daily Traffic
AAWT	Average Annual Weekday Traffic
AEP	Annual Exceedance Probability
AD	Anno Domini
ADMS	Atmospheric Dispersion Modelling System
ALC	Agricultural Land Classification
AOD	Above Ordnance Datum
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
ARCADY	Roundabout Capacity Analysis Software
ARN	Affected Road Network
AStGWF	National Areas Susceptible to Groundwater Flooding
BAP	Biodiversity Action Plan
BCC	Birmingham City Council
BGS	British Geological Survey
BMVL	Best and Most Versatile Land
BNL	Basic Noise Level
BOD	Biochemical Oxygen Demand
BS	British Standard
CEMP	Construction Environmental Management Plan
CEnv	Chartered Environmentalist
CFA	Continuous Flight Auger
CIEEM	Chartered Institute of Ecology and Environmental Management
CO <sub>2</sub>	Carbon Dioxide
CoPA	Control of Pollution Act
CL:AIRE	Contaminated land: Applications in Real Environments
CRoW	Countryside and Rights of Way
CRTN	Calculation of Road Traffic Noise
dB	Decibel
DCO	Development Consent Order
Defra	Department for the Environment Food and Rural Affairs
DfS	Departures from Standard
DfT	Department for Transport
DCLG	Department for Communities and Local Government
DM	Do Minimum
DTM	Digital Terrain Model
DMRB	Design Manual For Roads and Bridges
DO	Dissolved Oxygen
DS	Do Something
EAR	Environmental Assessment Report
EC	European Community
EclA	Ecological Impact Assessment
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMP	Environmental Management Plan
END	Environmental Noise Directive
ENVIS	Environmental Information System
ESA	Environmentally Sensitive Area
EU	European Union
FRA	Flood Risk Assessment
GAA	Gaelic Athletic Association
GCN	Great Crested Newt
GHG	Greenhouse Gas
GWDTE	Groundwater Dependent Terrestrial Ecosystems
GES	Good Ecological Status

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GLVIA	Guidelines for Landscape and Visual Impact Assessment
GVZ	Groundwater Vulnerability Zone
HAPMS	Highways Agency Pavement Management System
HAWRAT	Highways Agency Water Risk Assessment Tool
HDV	Heavy Duty Vehicles
HBAP	Highways England Biodiversity Plan
HE	Historic England
HEMP	Handover Environmental Management Plan
HER	Historical Environment Record
HGV	Heavy Goods Vehicle
HPI	Habitat of Principal Importance
HRA	Habitat Regulations Assessment
HRA	Hot Rolled Asphalt
HWRC	Household Waste Recycling Centre
IAN	Interim Advice Note
IAQM	Institute of Air Quality Management
ICD	Inscribed Circle Diameter
IEEM	Institute of Ecological and Environmental Management
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
JLR	Jaguar Land Rover
LAQM	Local Air Quality Management
LCA	Local Character Area
LBAP	Local Biodiversity Action Plan
LCLIP	Local Climate Impacts Profile for Birmingham
LCT	Landscape Character Type
LDV	Light Duty Vehicles
LGS	Local Geological Site
LET&C	Low Emissions Towns and Cities Programme
LLFA	Lead Local Flood Authority
LOAEL	Lowest Observable Adverse Effect Level
LNR	Local Nature Reserve
LPA	Local Planning Authority
LPACO	Local Planning Authority Conservation Officer
LTT	Long Term Trend
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
MAC	Managing Agent Contractor
MAGIC	Multi-agency Geographic Information Centre
mAOD	Metres Above Ordnance Datum
MCHW	Manual of Contract Document for Highways Works
MSA	Motorway Service Area
NEC	National Exhibition Centre
NERC	Natural Environment and Rural Communities
NCA	National Character Area
NHLE	National Heritage List for England
NIA	Noise Important Areas
NMM	National Motorcycle Museum & Conference Centre
NMU	Non-Motorised User
NNNPS	National Networks National Policy Statement
NoD	Notice of Determination
NOEL	No Observed Effect Level
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
NPPF	National Planning Policy Framework
NPSE	National Policy Statement for England
NPSNN	National Policy Statement for National Networks
NSIP	Nationally Significant Infrastructure Project
NSR	Noise Sensitive Receptors

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NVC	National Vegetation Classification
NVZ	Nitrate Vulnerable Zone
NWFD	Non Waste Framework Directive
NWBC	North Warwickshire Borough Council
OS	Ordnance Survey
PA	Planning Act 2008
PEIR	Preliminary Environmental Information Report
PCF	Project Control Framework
PFRA	Preliminary Flood Risk Assessment
PINS	Planning Inspectorate
PM	Particulate Matter
PPG	Planning Practice Guidance
PPS	Planning Policy Statement
PRA	Preferred Route Announcement
PRoW	Public Right of Way
pLWS	Potential Local Wildlife Site
RIGS	Regionally Important Geological Sites
RIS	Regional Investment Strategy
RFC	Ratio of Flow to Capacity
RoD	Record of Determination
SAAR	Standard Annual Average Rainfall
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SFAIRP	So Far As Is Reasonably Practicable
SGAR	Stage Gate Assessment Review
SMBC	Solihull Metropolitan Borough Council
SPA	Special Protection Area
SOAEL	Significant Observed Adverse Effect Level
SPZ	Source Protection Zone
SoCC	Statement of Community Consultation
SRN	Strategic Road Network
SRO	Senior Responsible Owner
SSSI	Site of Special Scientific Interest
STW	Severn Trent Water
SuDS	Sustainable Drainage Systems
SWMP	Site Waste Management Plan
TAG	Transport Analysis Guidance
TPH	Total Petroleum Hydrocarbons
TRA	Traffic Reliability Area
TRL	Transport Research Laboratory
UK	United Kingdom
UKC	United Kingdom Central (Previously known as the M42 Economic Gateway)
ULSD	Ultra-Low Sulphur Diesel
WBCSD	World Business Council for Sustainable Development
WCA	Waste Collection Authority
WCC	Warwickshire County Council
WDA	Waste Disposal Authority
WebTAG	Transport Analysis Guidance Website
WFD	Water Framework Directive
WGCG	Warwickshire Geological Conservation Group
WSP	WSP Global Inc
VE	Visual Envelope
VISSUM	Traffic Simulation
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence



## 17. APPENDICES

Appendix 6.1: Designated Heritage Assets Gazetteer

Appendix 6.2 Non-Designated Heritage Assets Gazetteer

Appendix 7: Landscape Viewpoint Table

Appendix 8A: Phase 1 Habitat Survey Report

Appendix 8B: Bat Scoping Assessment Report and supporting Figure

Appendix 8C: Watervole Survey Report and supporting Figure

Appendix 8D: Great Crested Newt Survey Report and supporting Figure

Appendix 8E: Reptile Survey Report and supporting Figure

Appendix 8F: Crayfish Scoping Assessment Report

Appendix 8G: Woodland NVC Report

Appendix 8H: Grassland NVC Report and supporting Figure

Appendix 8I: Ecological Legislation and Planning Policy

Appendix 13.1: Water Resources Site Photographs

## 18. LOCATION AND DESIGN PLANS

Figure 1.1: Proposed Application Site

Figure 5.1: Air Quality Study Area

Figure 5.2: Air Quality Monitoring Locations

Figure 6.1: Location of Designated Heritage Assets

Figure 6.2: Location of Designated Heritage Assets

Figure 6.3: Location of Non-Designated Heritage Assets

Figure 6.4: Location of Non-Designated Heritage Assets

Figure 7.1(a+b): Landscape Viewpoint Locations

Figure 7.2(a-w): Landscape Viewpoints

Figure 8.1: Statutory Nature Conservation Designations within the Study Area

Figure 8.2: Non-Statutory Nature Conservation Designations within the Study Area

Figure 8.3(a+b): Phase 1 Habitat Survey

Figure 8.4: Great Crested Newt Survey Mapping

Figure 9.1(a+b): Preliminary Constraints Plan and Legend

Figure 11.1: Noise Study Extents

Figure 11.2: Noise Affected Links Opening Year (2023)

Figure 11.3: Noise Affected Links Future Year (2038)

Figure 12.1: People and Communities Constraints Plan

Figure 13.1: Water Resource Features and their Attributes

Figure 15.1: Zone of Influence for each Environmental Topic