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# M4 Junction 17 Improvements Outline Business Case (Major Road Network Fund)

Options Assessment Report Refresh

Wiltshire Council

A1

# Notice

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This document has 75 pages including the cover.

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## Client signoff

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# Contents

| Chapter   | Page      |
|---|-----------|
| <b>1. Introduction</b>  | <b>6</b>  |
| 1.1. Overview   | 6         |
| 1.2. Context  | 7         |
| 1.3. Background to the scheme   | 7         |
| 1.4. Document purpose and structure                                   | 8         |
| <b>2. Step 1 - Understanding the current situation</b>                | <b>10</b> |
| 2.1. Overview   | 10        |
| 2.2. Current transport and other policies                             | 10        |
| 2.3. Current travel demands and level of service                      | 20        |
| 2.4. Current network provision  | 22        |
| 2.5. Constraints  | 31        |
| 2.6. Opportunities  | 35        |
| 2.7. Summary  | 36        |
| <b>3. Step 2: Understanding the future situation</b>                  | <b>37</b> |
| 3.1. Overview   | 37        |
| 3.2. Future land-use  | 37        |
| 3.3. Future transport system changes                                  | 42        |
| 3.4. Forecast traffic flows and delays                                | 42        |
| 3.5. Summary  | 45        |
| <b>4. Step 3: Establishing the need for intervention</b>              | <b>46</b> |
| 4.1. Overview   | 46        |
| 4.2. Current transport-related problems                               | 46        |
| 4.3. Future transport-related problems                                | 47        |
| 4.4. Summary of the need for intervention                             | 47        |
| <b>5. Step 4 - Identifying objectives</b>                             | <b>49</b> |
| 5.1. Overview   | 49        |
| 5.2. Objectives from key policy documents                             | 49        |
| 5.3. Strategic outcomes   | 51        |
| 5.4. Transport objectives   | 51        |
| 5.5. Define geographic area of impact                                 | 53        |
| <b>6. Initial option assessment (Steps 5-6)</b>                       | <b>54</b> |
| 6.1. Step 5: Generating options                                       | 54        |
| 6.2. Step 6: Initial Sifting  | 54        |
| <b>7. Further assessment (Steps 7-8)</b>                              | <b>59</b> |
| 7.1. Step 7 (Part 1): Development and assessment of potential options | 59        |
| 7.2. Step 7 (Part 2): Option refinement                               | 62        |
| 7.3. Step 8: Document the option assessment process                   | 69        |
| <b>8. Summary and conclusions</b>                                     | <b>70</b> |
| <b>Appendices</b>   | <b>72</b> |
| <b>Appendix A. Option sifting results</b>                             | <b>73</b> |
| A.1. Option B scoring   | 73        |
| A.2. Option C scoring   | 74        |

|                        |    |
|------------------------|----|
| A.3. Option B+ scoring | 75 |
|------------------------|----|

## Tables

|   |    |
|---|----|
| Table 2-1 - Western Gateway STB Strategic Transport Plan objectives                           | 13 |
| Table 2-2 - Wiltshire Emerging Spatial Strategy Requirements                                  | 18 |
| Table 2-3 - A350 improvement schemes completed in Chippenham as of March 2021                 | 24 |
| Table 2-4 - Weekday Average Traffic conditions at M4 Junction 17 (September 2019)             | 25 |
| Table 2-5 - Travel time (seconds) at M4 Junction 17 off-slips                                 | 27 |
| Table 2-6 - Collision frequency   | 30 |
| Table 2-7 – Collisions benchmarking (2014-2020)   | 30 |
| Table 3-1 - Planned and future growth   | 37 |
| Table 3-2 - Chippenham Gateway, Hullavington and Future Chippenham M4 Junction 17 mitigations | 41 |
| Table 3-3 - Future transport schemes  | 42 |
| Table 3-4 - Overall vehicle flows (PCUs) at M4 Junction 17                                    | 42 |
| Table 4-1 - M4 Junction 17 - the need for intervention  | 48 |
| Table 5-1 - Relevant national, regional and local policy and study objectives                 | 49 |
| Table 5-2 - Scheme objectives   | 52 |
| Table 6-1 - Option long-list  | 54 |
| Table 6-2 – Strategic Case - scoring of individual options against objectives                 | 56 |
| Table 6-3 - 1 <sup>st</sup> stage sift – Strategic and Economic Case summary                  | 57 |
| Table 6-4 - 1 <sup>st</sup> stage sift – Management, Financial and Commercial Cases summary   | 58 |
| Table 6-5 - Option sifting  | 58 |
| Table 7-1 – LinSig junction modelling results   | 60 |
| Table 7-2 – Summary of further assessment scoring   | 61 |
| Table 7-3 – Further assessment, option refinement (Option B+) scoring                         | 62 |
| Table 7-4 - Maximum Queue Results- M4 Junction 17 B+  | 63 |

## Figures

|   |    |
|---|----|
| Figure 1-1 - M4 Junction 17 location and Western Gateway A350 Strategic Corridor            | 6  |
| Figure 1-2 - Completed, committed and planned schemes on the northern A350                  | 8  |
| Figure 1-3 – TAG eight-step process for options development                                 | 9  |
| Figure 2-1 - Summary of relevant transport policies   | 11 |
| Figure 2-2 - Swindon and Wiltshire Strategic Economic Plan Zones                            | 16 |
| Figure 2-3 - Relationship between Wiltshire Local Plan Review and existing policy documents | 17 |
| Figure 2-4 - Wiltshire Local Plan (2036) proposed development sites - Chippenham            | 19 |
| Figure 2-5 - Morning Peak base model acceptable speed plot                                  | 21 |
| Figure 2-6 - Evening peak base model acceptable speed plot                                  | 22 |
| Figure 2-7 - Aerial photograph of M4 Junction 17  | 23 |
| Figure 2-8 - Select link analysis of traffic approaching and exiting to M4 Junction 17      | 26 |
| Figure 2-9 - M4 Junction 17 eastbound off-slip travel time                                  | 28 |
| Figure 2-10 - M4 Junction 17 westbound off-slip travel time                                 | 28 |
| Figure 2-11 - M4 Junction 17 eastbound off-slip vehicle flows                               | 29 |
| Figure 2-12 - M4 Junction 17 westbound off-slip vehicle flows                               | 29 |
| Figure 2-13 - Collision locations (2014 to 2019)  | 31 |

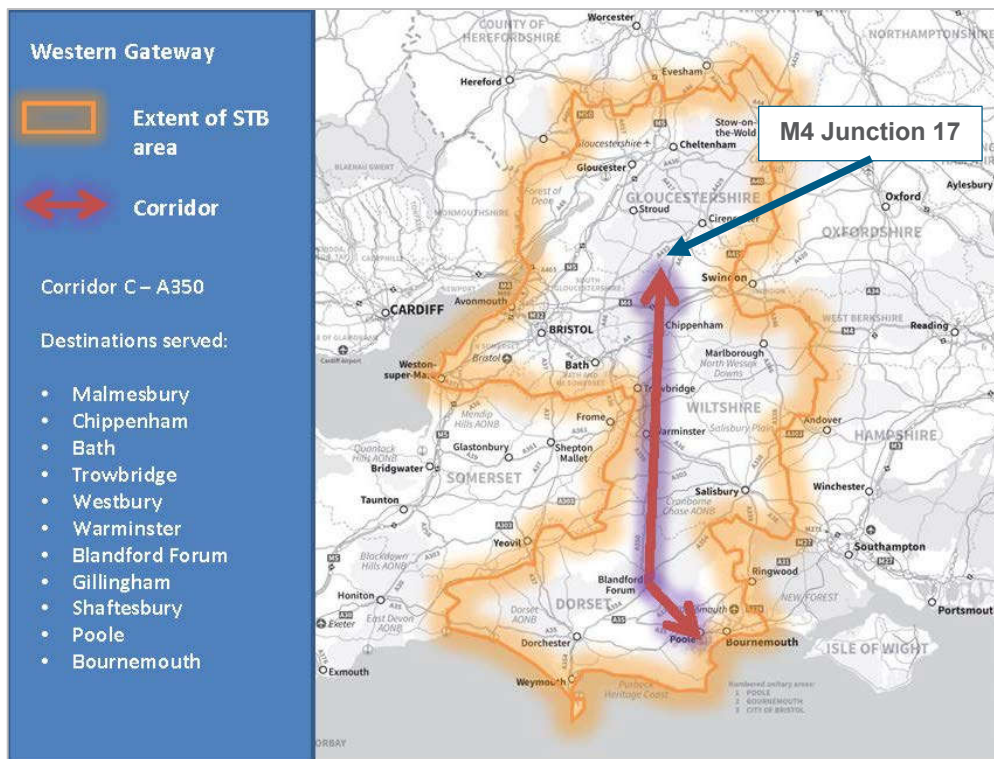
|   |    |
|---|----|
| Figure 2-14 - Environmental constraints map   | 32 |
| Figure 3-1 - Key development sites  | 38 |
| Figure 3-2 - Planned and committed schemes  | 40 |
| Figure 3-3 - Planned and future growth – average peak hour traffic flow (2051 PCUs) | 43 |
| Figure 3-4 - V/C Plot (2051 AM Peak)  | 44 |
| Figure 3-5 - V/C Plot (2051 PM Peak)  | 45 |
| Figure 4-1 - Summary of issues identified – the need for intervention               | 46 |
| Figure 5-1 - M4 Junction 17 area of impact  | 53 |
| Figure 6-1 - Sifting overview   | 55 |
| Figure 6-2 - Fail criteria for option sifting                                       | 55 |
| Figure 7-1 – M4 Junction 17 highway options   | 59 |
| Figure 7-2 - 2036 Do Minimum Acceptable Speed: Morning Peak                         | 65 |
| Figure 7-3 - 2036 B+ Acceptable Speed: Morning Peak                                 | 66 |
| Figure 7-4 - 2036 Do Minimum Acceptable Speed: Evening Peak                         | 67 |
| Figure 7-5 - 2036 B+ Acceptable Speed: Evening Peak                                 | 68 |
| Figure 8-1 - Sifting summary  | 70 |
| Figure 8-2 – M4 Junction 17 refined Option B+                                       | 71 |

# 1. Introduction

## 1.1. Overview

1.1.1.1. This is the Options Assessment Report (OAR) Refresh for the M4 Junction 17 improvements scheme. M4 Junction 17 is located at the intersection of the M4 and A350, near Chippenham (Wiltshire). The A350 is a key north-south route between the M4 corridor and the south coast, and is a key corridor identified by the Western Gateway Sub-national Transport Body (STB). M4 Junction 17 is located to the north of the A350 Growth Zone identified in the Swindon and Wiltshire Strategic Economic Plan. The significance of the A350 corridor in terms of the local and regional economy has been recognised in recent Local Pinch Point Scheme and Local Growth Fund (LGF) awards for upgrades to sections of the Chippenham Bypass as well as improvements to M4 Junction 17 itself. The location of M4 Junction 17 is shown on Figure 1-1.

Figure 1-1 - M4 Junction 17 location and Western Gateway A350 Strategic Corridor



1.1.1.2. This OAR Refresh will support the Outline Business Case (OBC) for the M4 Junction 17 improvements scheme. It is a refresh of the original OAR completed in 2019 providing the opportunity to update the evidence base (where appropriate) and to ensure the scheme is considered in the most recent policy context. This OAR Refresh introduces a refined additional option for the scheme.

1.1.1.3. Wiltshire Council is the promoter for the scheme, which has been recognised as an investment priority by the Western Gateway Shadow Sub-national Transport Body (STB). The scheme is located on Highways England's network – Wiltshire Council is seeking to work collaboratively with Highways England to agree on a preferred option. A Strategic Outline Business Case (SOBC) was submitted to the Department for Transport (DfT) in 2019, and an OBC is planned for submission in Autumn 2021.

## 1.2. Context

### 1.2.1. The Major Road Network

- 1.2.1.1. Wiltshire Council is applying to the DfT for funding from the Major Road Network (MRN) fund for the M4 Junction 17 Improvements scheme. Located where the M4 meets the A350, M4 Junction 17 is an intersection between the Strategic Road Network (SRN) and the MRN. The MRN was adopted by the DfT in 2017 as part of the Transport Investment Strategy and implemented towards the end of 2018<sup>1</sup>. The MRN was introduced to form a middle tier of roads sitting between the national SRN and the rest of the local road network and covers the UK's busiest and most economically important local authority 'A' roads.
- 1.2.1.2. The DfT will normally contribute between £20 million and £50 million<sup>2</sup> towards schemes on the MRN through the MRN/LLM fund, although the lower threshold will not be applied rigidly.
- 1.2.1.3. The MRN funding guidance sets out the criteria for schemes which are eligible for MRN funding, with the most relevant to the M4 Junction 17 improvements being:
- Bypasses or realignments which alleviate congestion;
  - New roads that link existing stretches of the MRN or SRN;
  - Widening of existing MRN roads where there are congestion points or safety risks;
  - Traffic management and smart technology; and
  - Packages of improvements.

### 1.2.2. Western Gateway Sub-national Transport Body

- 1.2.2.1. The Western Gateway STB has identified the A350 as a key strategic route (see Figure 1-1). There is a need for an effective north-south link between the M4 and the south coast in order to open up new business opportunities by making it easier to transport freight from the south coast ports, and by improving road access to London as well as the rest of the Western Gateway area. The Western Gateway STB prioritised the M4 Junction 17 scheme for MRN funding in its Regional Evidence Base submitted to the DfT in July 2019. The role of the A350, the relevant policy context, and the route's current conditions and performance are reviewed in detail in Chapter 2 of this OAR.

## 1.3. Background to the scheme

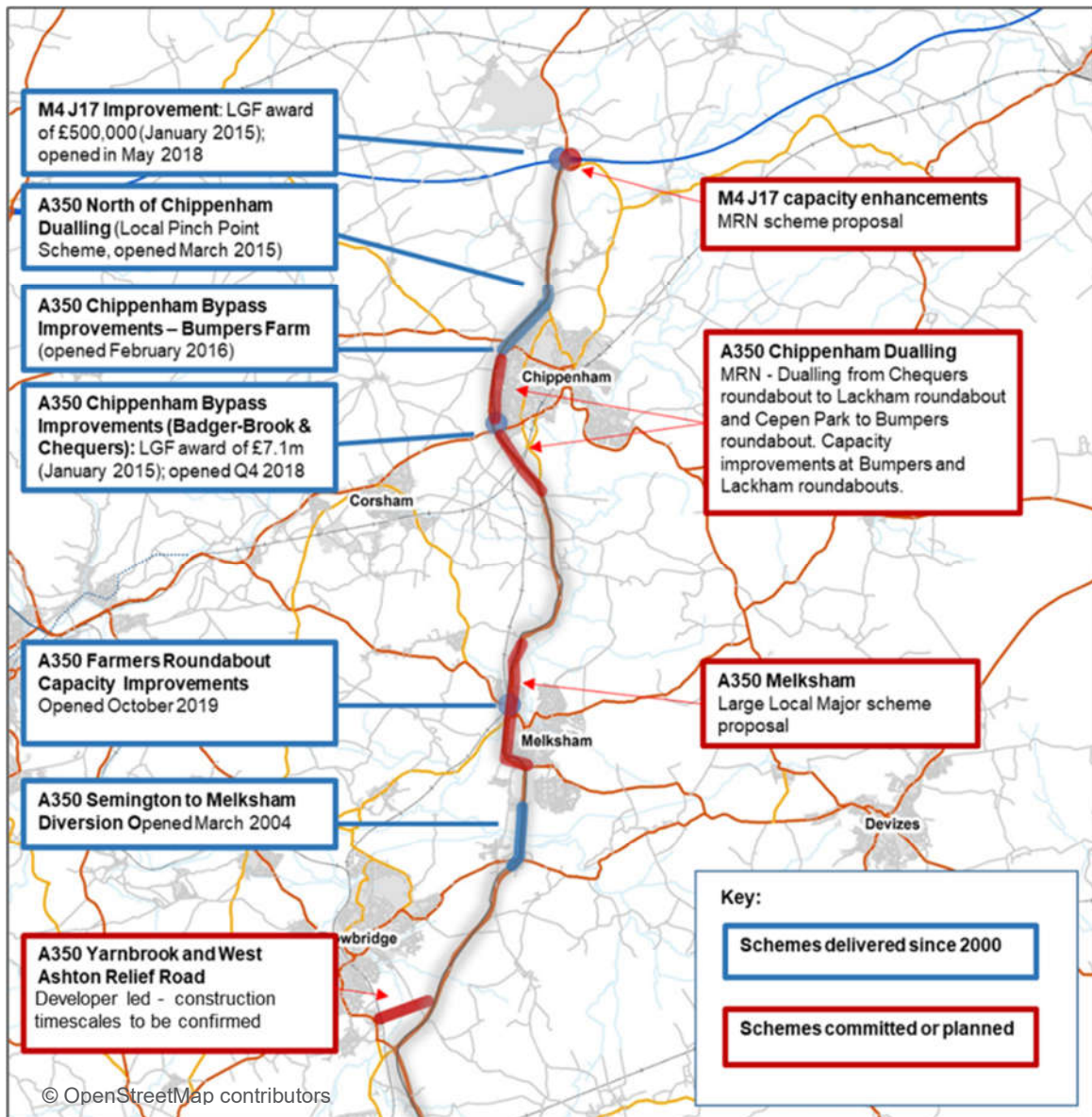
- 1.3.1.1. The proposed MRN improvements at M4 Junction 17 are part of Wiltshire Council's progressive improvements to the A350 which have been delivered since 2004 (see the schemes outlined in blue in Figure 1-2). The northern section of the A350 between Melksham and Chippenham has seen substantial investment over the past few years, delivering additional capacity to the corridor. M4 Junction 17 has also recently seen LGF investment in 2018 to improve safety at the junction whilst enhancing traffic flows.
- 1.3.1.2. This scheme to upgrade M4 Junction 17 is being brought forward to cater for significant growth planned for the A350 corridor, particularly around Chippenham. The Future Chippenham/Chippenham Urban Expansion has been identified as a potential site to deliver a proportion (7,500 dwellings) of the Chippenham Housing Market Area's (HMA) housing needs. 5,100 of these dwellings are currently proposed in the Local Plan Review to 2036.
- 1.3.1.3. The schemes outlined in **red** in Figure 1-2 have been identified as a priority by the Western Gateway STB for MRN/LLM funding. It is important that the M4 Junction 17 Improvements scheme accounts for the other proposed MRN improvements to the A350, since improvements to the south at Chippenham and Melksham are anticipated to slightly increase the volume of traffic using M4 Junction 17.

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<sup>1</sup> <https://www.gov.uk/government/publications/major-road-network-and-large-local-majors-programmes-investment-planning>

<sup>2</sup> Large Local Majors (LLM) covers schemes greater than £50M.

Figure 1-2 - Completed, committed and planned schemes on the northern A350

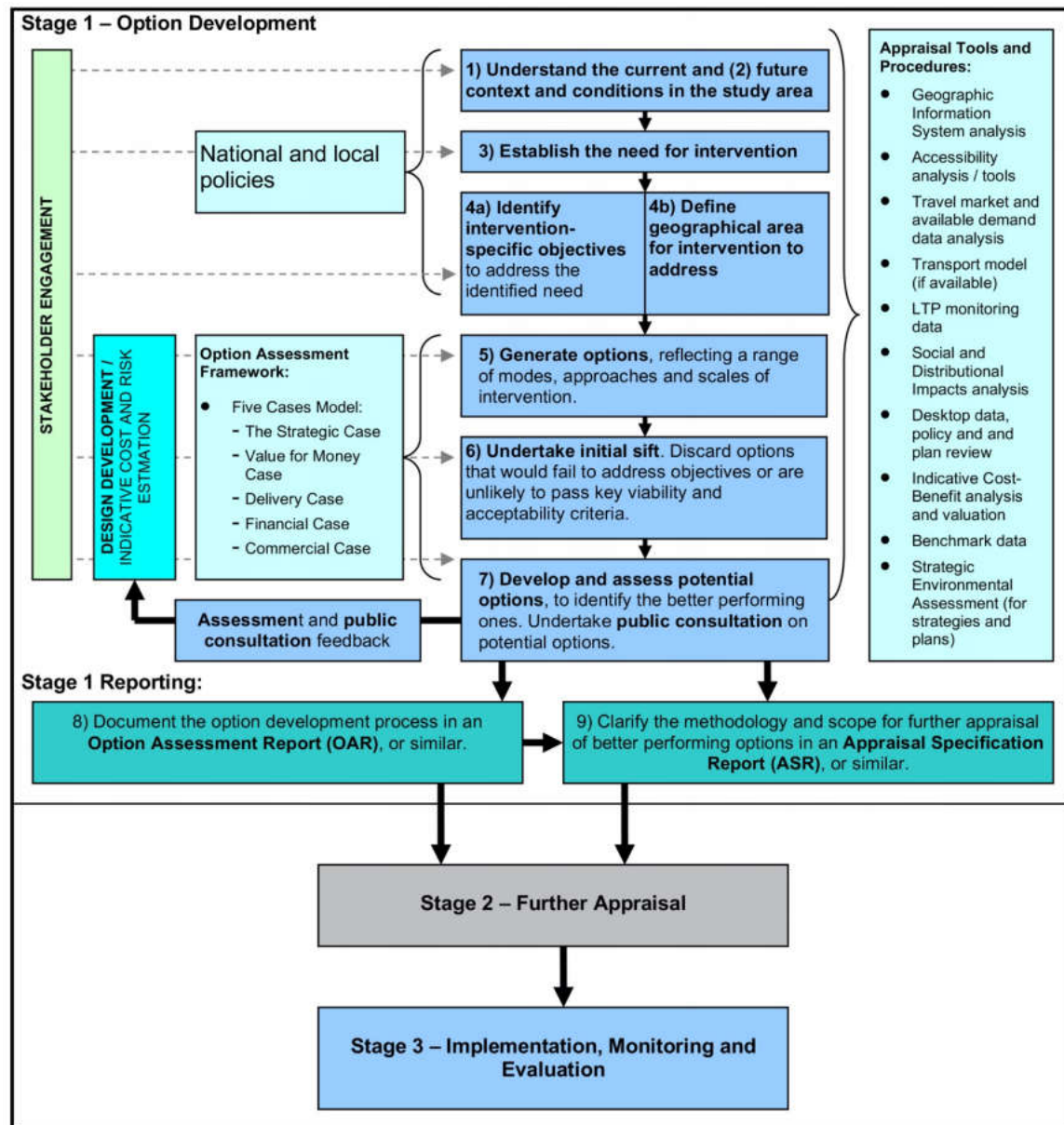


## 1.4. Document purpose and structure

- 1.4.1.1. This OAR Refresh sets out the key transport problems, objectives and high-level options for the M4 Junction 17 Improvements scheme. It presents an additional option developed since the original OAR was produced in 2019. The overarching aim of the OAR is to confirm the most appropriate option(s) to be taken forward for full appraisal as part of the OBC.
- 1.4.1.2. The structure of this document matches the eight-step process that is recommended for the options development stage in TAG Unit 2.1.2d (see Figure 1-3).



Figure 1-3 – TAG eight-step process for options development



1.4.1.3. These eight steps from TAG have been grouped as follows in this OAR:

- Chapter 2 sets out the current situation at M4 Junction 17, outlining the relevant policy context, current travel demands and levels of service as well as opportunities and constraints (Step 1);
- Chapter 3 sets out the future situation at M4 Junction 17, assessing the future land-use policies, planned future changes to the local network as well as the future travel demand (Step 2);
- Chapter 4 establishes the need for intervention (Step 3);
- Chapter 5 sets out the objectives that should be met by any scheme options being considered and defines the geographical area for intervention (Step 4);
- Chapter 6 provides the initial options assessment, setting out a long-list of options which are assessed against the identified scheme objectives and put through an initial sift (Steps 5 and 6);
- Chapter 7 presents a more detailed options assessment based on the results of the initial sift and sets out the options that are recommended to continue to OBC (Step 7); and
- Chapter 8 sets out the summary and conclusions of the OAR (Step 8).

## 2. Step 1 - Understanding the current situation

### 2.1. Overview

2.1.1.1. This section sets out the current situation in the study area in terms of:

- Current transport and other policies;
- Current travel demand and levels of service; and
- Current opportunities and constraints.

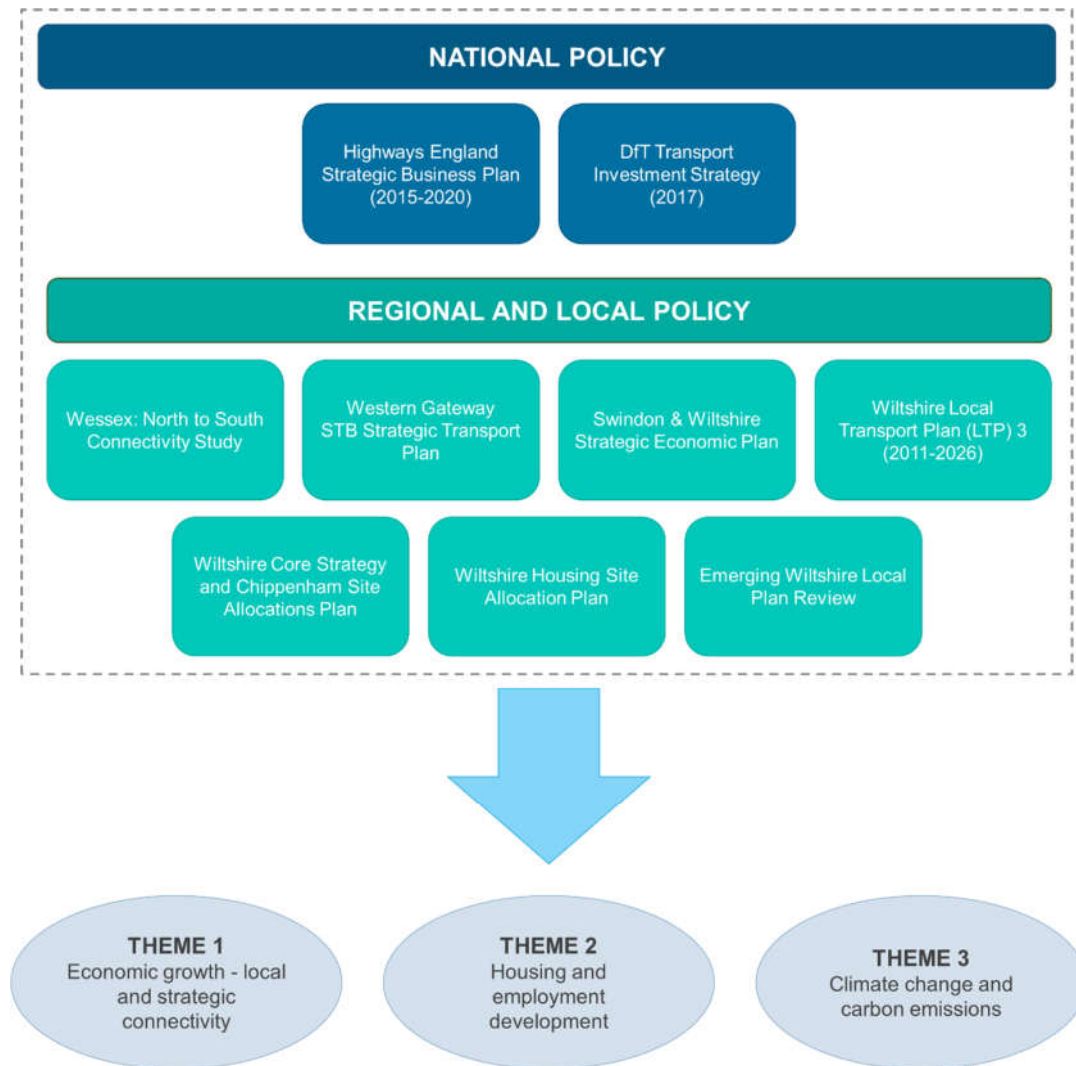
2.1.1.2. The key issues identified are summarised at the end of the section and form the basis for Chapter 4 which sets out the need for intervention.

### 2.2. Current transport and other polices

#### 2.2.1. Summary of relevant transport policies

2.2.1.1. This section reviews the key policy documents listed in Figure 2-1 to set out the policy context for the M4 J17 Improvements scheme. The policies have been grouped under three key themes.

Figure 2-1 - Summary of relevant transport policies



## 2.2.2. Theme 1 – Economic growth - local and strategic connectivity

### DfT Transport Investment Strategy (2017)

2.2.2.1. The Transport Investment Strategy (DfT, 2017) places a high priority on creating a more reliable, less congested, and better-connected transport network. In support of this it introduced the concept of the Major Road Network (MRN), which includes the busiest and most economically important local authority 'A' roads and forms a middle tier of roads sitting between the national Strategic Road Network (SRN) and the rest of the local road network. The objectives of the MRN are:

- Reducing congestion;
- Supporting economic growth and rebalancing;
- Supporting housing delivery;
- Supporting all road users; and
- Supporting the Strategic Road Network (SRN).

### Highways England Strategic Business Plan (2020-2025)

2.2.2.2. The Highways England Strategic Business Plan (2020-2025) outlines the primary strategic outcomes the company aims to achieve with its network and any schemes impacting it.

- 2.2.2.3. Highways England has identified eight key performance specifications which aim to improve the performance of its network:
- Improving safety for all;
  - Providing fast and reliable journeys;
  - A well-maintained and resilient network;
  - Delivering better environmental outcomes;
  - Meeting the needs of all users; and
  - Achieving efficient delivery.
- 2.2.2.4. The M4 Junction 17 scheme will aim to alleviate future congestion from proposed developments and help to attract new developments to the area through a reduction in journey times. Simultaneously, the scheme will make the network safer and more efficient, provide smoother traffic flows for motorists entering and exiting the M4, and improve overall user satisfaction by helping to reduce collisions and time delays at this key junction on the SRN. To avoid disrupting strategic traffic and impacting on user satisfaction, a single comprehensive improvements scheme is required, rather than a series of progressive development related improvements.
- South of England North to South Connectivity Study**
- 2.2.2.5. The South of England North to South Connectivity Study (2017)<sup>3</sup> considered the wider economic benefits from improvements to the A36/A46 and A350 corridors, both of which provide north-south connectivity between the M4 corridor and the south coast. It was commissioned by the Councils of Wiltshire, Dorset and Bath and North East Somerset in 2016. The concern highlighted by the study is that Dorset and Wiltshire have poor connectivity to the major areas of economic activity to the north in comparison with the neighbouring areas of Devon (connected by the M5) and Hampshire (connected by the M3 and A34), and that this is contributing to relatively low productivity in Dorset and Wiltshire.
- 2.2.2.6. A 'Case for Action'<sup>4</sup> was submitted to the UK government in 2017 by Wiltshire, Dorset, and Bath and North-East Somerset Councils. It makes the case for the strategic and economic role of the A350 to be recognised nationally, and for investment in the route beyond dualling around Chippenham to address key pinch-points such as Beanacre/Melksham and Westbury.
- 2.2.2.7. The North-South Connectivity Study Summary Report (2019)<sup>5</sup> highlights the problems caused by poor connectivity in the north-south corridor. These include environmental problems in the cities, towns and villages on the route caused by slow-moving traffic, poor access to the Port of Poole and constraints to the economic performance of the region. The prospectus and supporting economic study also demonstrate the potential economic benefits of improved connectivity in the corridor. Effective transport connectivity is an important component in supporting the vitality of regional economies, city regions, market towns and their hinterlands, through the following mechanisms:
- Improving labour market efficiency (enabling businesses to access employees, and residents to access jobs, education and training);
  - Increasing business connectivity (enabling businesses to access markets, supply chains and collaboration networks);
  - Access to international gateways (enabling businesses to access global markets and encouraging inward investment and inbound tourism to the UK); and
  - Enabling development (both new employment space to support growing businesses and new homes to meet the needs of the labour market – and the connectivity between them).
- 2.2.2.8. In March 2020, the UK government announced funding for a study into the A350 between M4 Junction 17 and Poole, known the M4 to Dorset Coast strategic route. The study, being funded as part of Highways England's Road Investment Strategy 2 (RIS2), will consider options for improving

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<sup>3</sup> South of England North-South Connectivity: Economic Study [https://beta.bathnes.gov.uk/sites/default/files/2018-10/north\\_south\\_connectivity\\_final\\_report\\_081117.pdf](https://beta.bathnes.gov.uk/sites/default/files/2018-10/north_south_connectivity_final_report_081117.pdf)

<sup>4</sup> South of England North-South Connectivity Prospectus [https://www.bathnes.gov.uk/sites/default/files/connectivity\\_prospectus\\_single\\_page\\_version.pdf](https://www.bathnes.gov.uk/sites/default/files/connectivity_prospectus_single_page_version.pdf)

<sup>5</sup> North-South Connectivity Study Summary Report <https://beta.bathnes.gov.uk/sites/default/files/2019-10/South%20of%20England%20NS%20Connectivity%20report%20summary%2006%2003%2019.pdf>

north-south connectivity. As part of these options, the A350 would be managed by Highways England rather than Wiltshire Council in the future.

- 2.2.2.9. Poor journey time reliability across the A350 corridor constrains economic performance, in terms of agglomeration and productivity. It is therefore of importance to deliver infrastructure improvements to improve journey times and subsequent economic performance. Improvements at M4 Junction 17 (located at the northernmost point of the A350) can enhance access from the A350 MRN route on to the SRN.

**Western Gateway STB Strategic Transport Plan**

- 2.2.2.10. The Western Gateway STB published its Strategic Transport Plan in March 2020. The aim of the plan is *“to enable clean growth and increased use of sustainable transport through a long-term investment programme designed to deliver a well-connected, clean, reliable and resilient strategic transport system; one that closes productivity gaps, provides a better quality of life for people across the region and makes the Gateway area more competitive while respecting its world class natural and built environments”*.
- 2.2.2.11. The plan outlines a number of objectives under three key themes, which are presented in Table 2-1. In particular, the Plan identifies the A350 as a key strategic route which is facing resilience issues due to limited capacity and delays.

**Table 2-1 - Western Gateway STB Strategic Transport Plan objectives**

|                                 |  |
|---------------------------------|--|
| <b>Economic Objectives</b>      | Ensure the effective operation of labour markets   |
|                                 | Enable greater integration between employment clusters   |
|                                 | Enhance business connectivity to international markets   |
|                                 | Improve North-South connectivity   |
|                                 | Provide a robust regional evidence base in support of the local plan making process which understands different travel markets and use of strategic travel corridors |
| <b>Social Objectives</b>        | Influence the sustainable delivery of new homes and employment opportunities   |
|                                 | Support multi-modal travel options for urban travel to work areas  |
|                                 | Improve transport and digital connectivity to reduce poverty and deprivation   |
|                                 | Embrace the role of technology in supporting strategic travel  |
| <b>Environmental Objectives</b> | Decarbonisation of the strategic transport network   |
|                                 | Adoption of electrification and/or use alternative fuels to enable fossil-fuel-free transport  |
|                                 | Improve air quality  |
|                                 | High quality digital connectivity to reduce the need for travel  |

- 2.2.2.12. One of the main transport requirements identified in the Strategic Transport Plan is making an effective north-south link between the M4 and the south coast. This will open up new business opportunities by making it easier to transport freight from the ports and improve road access to London and the rest of the Western Gateway area. The Western Gateway’s Missing Link Strategic Corridor V2 - Midlands to South Coast highlights the need for investment in the A350 corridor, which is being investigated as part of the recently announced RIS 2 Highways England strategic study portfolio.
- 2.2.2.13. The A350 corridor has the potential to drive change in the Dorset and Wiltshire economies and benefit the whole of the Western Gateway area through better access to its coastal international gateways and providing additional strategic resilience and connectivity for north-south movements in the Western Gateway area.

- 2.2.2.14. The M4 Junction 17 Improvements scheme is a Western Gateway STB transport priority, identified to support growth along the M4 corridor and facilitate development in the A350 growth corridor in Wiltshire<sup>6</sup>.

#### Wiltshire Local Transport Plan (LTP) 3 (2011-2026)

- 2.2.2.15. The overarching LTP3 vision is “to develop a transport system which helps support economic growth across Wiltshire’s communities, giving choice and opportunity for people to access essential services”. Transport solutions are identified that will help to improve the quality of life and be sensitive to the built and natural environment.

- 2.2.2.16. Specific relevant strategic transport objectives from the LTP include:

- SO1 – to support and help improve the vitality, viability and resilience of Wiltshire’s economy and market towns;
- SO4 – to minimise traffic delays and disruption and improve journey time reliability on key routes;
- SO6 – to make the best use of the existing infrastructure through effective design, management and maintenance;
- SO8 – improve safety for all road users and reduce the number of casualties on Wiltshire’s roads;
- SO10 – to encourage the efficient and sustainable distribution of freight in Wiltshire; and,
- SO12 – to support planned growth in Wiltshire.

- 2.2.2.17. The proposed improvement to M4 Junction 17 aligns with the LTP’s economic growth and safety objectives.

#### ‘Port of Poole’ Free Port Application

- 2.2.2.18. Bournemouth, Christchurch and Poole Council, Bournemouth Airport and Poole Harbour Commissioners have submitted an application for free port designation in February 2021, which would allow industries within the area to import goods and then re-export them outside normal tax and customs rules. If successful, the designation is expected to result in a considerable increase in new job opportunities and foster economic growth in the region.

- 2.2.2.19. The A350 is a key north-south route between the M4 corridor and the south coast. There is a need for an effective north-south link between the M4 and the south coast to make it easier to transport freight from the south coast ports from the Western Gateway area.

### 2.2.3. Theme 2 - housing and employment development

- 2.2.3.1. At a national level the government has made strong commitments (such as within the Planning for the Future White Paper, August 2020).to build more homes, more quickly and take action to remove the barriers to getting onto the housing ladder.

- 2.2.3.2. The transport network, and specifically the A350 corridor, has a major role to play in meeting housing and employment needs in Wiltshire in a sustainable manner. Local economic and land use policy identifies the need for selective improvement to the A350 to maintain and enhance journey time reliability, with the aim of aiding housing and employment growth at Chippenham, Melksham, Trowbridge, Westbury and Warminster.

#### A350 Growth Zone - Swindon & Wiltshire Strategic Economic Plan

- 2.2.3.3. The Swindon and Wiltshire Strategic Economic Plan (SEP) was published by the Swindon & Wiltshire Local Enterprise Partnership (SWLEP) in March 2014 and refreshed in March 2016. The SEP sets out the economic strategy and delivery plan that will be funded through the LGF. It identifies three transport areas/corridors that will be the focus of economic growth:

- A350 Growth Zone;
- Swindon M4 Growth Zone; and
- Salisbury A303 Growth Zone.

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<sup>6</sup> Western Gateway STB Strategic Transport Plan 2020-2025 <https://westerngatewaystb.org.uk/strategy/2020-2025-western-gateway-strategic-transport-plan/>

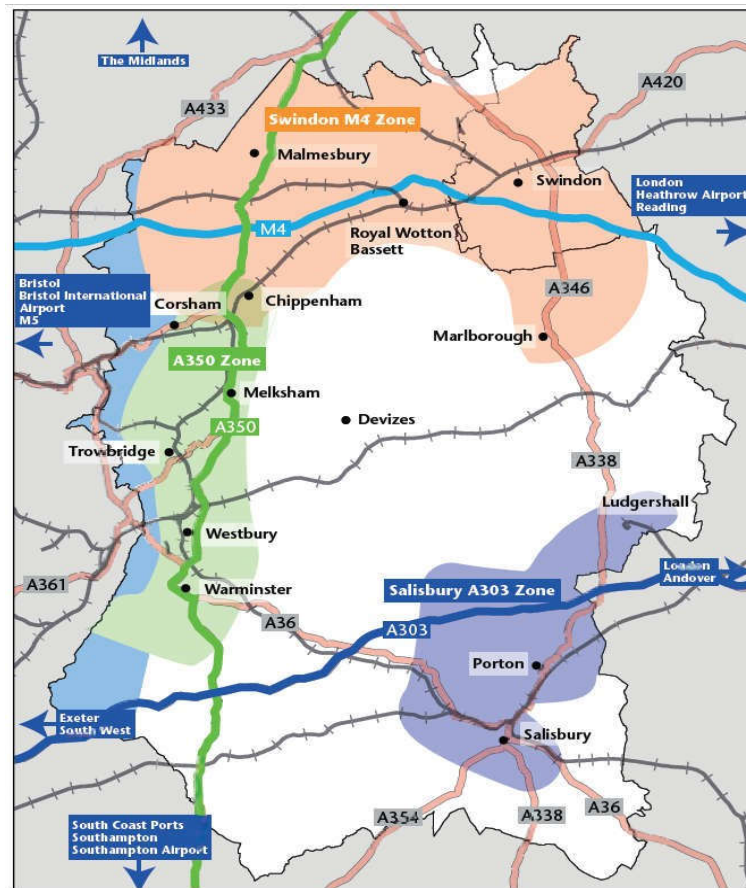
- 2.2.3.4. The Swindon M4 Growth Zone is identified in the SEP as a key area of economic activity. The zone covers surrounds the M4 corridor, and contains prominent employment centres including Swindon, Chippenham and Malmesbury. The Swindon M4 Growth Zone is a major agglomeration of economic activity, providing employment for over 160,000 people across 15,375 business, of which 75 are classed as large businesses (over 250 employees). Consequently, the zone is the SWLEP's primary economic zone, containing 46% of the SWLEP area's total business stock.
- 2.2.3.5. The A350 corridor is identified in the SEP as a key north-south route through the west of Wiltshire, and a major agglomeration of economic activity, which connects the settlements of Chippenham, Trowbridge, Melksham, Westbury and Warminster. The corridor has a combined population of some 190,000, which is equivalent to 26% of the total population of the SWLEP area<sup>7</sup>.
- 2.2.3.6. The towns along the A350 corridor create an interlinked series of local employment hubs which, in combination, are a major driver of economic growth. Strategic development of the corridor, which also includes three campuses of Wiltshire College as well as business parks and trading estates, has created a coherent economic Growth Zone that is home to 35 large businesses (>250 employees) and 8,200 small and medium-sized enterprises (SME) businesses (25% of the total business stock in the SWLEP area) and 79,400 employees<sup>8</sup> in 2014.
- 2.2.3.7. M4 Junction 17 is located at key location where the A350 Growth Zone and the Swindon M4 Growth Zone overlap (see Figure 2-2). Therefore it is important that M4 Junction 17 can accommodate growth along the A350 corridor as well as within the Swindon Growth Zone.

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<sup>7</sup> Appendix 1 Strategic Economic Plan - Swindon and Wiltshire Growth Zones: An Economic Overview (January 2016)  
<https://cms.wiltshire.gov.uk/documents/s111736/SEP%20Appendix%201.pdf>

<sup>8</sup> Swindon and Wiltshire Strategic Economic Plan (2016) [https://growthhub.swlep.co.uk/docs/default-source/strategy/economic-priorities/strategic-economic-plan---january-2016.pdf?sfvrsn=e7d58ea0\\_12](https://growthhub.swlep.co.uk/docs/default-source/strategy/economic-priorities/strategic-economic-plan---january-2016.pdf?sfvrsn=e7d58ea0_12)

Figure 2-2 - Swindon and Wiltshire Strategic Economic Plan Zones<sup>9</sup>



**Wiltshire Core Strategy and Chippenham Site Allocations Plan**

- 2.2.3.8. The Wiltshire Core Strategy (WCS), adopted in January 2015, sets out the Council’s spatial vision, key objectives and overall principles for development in the county over the plan period 2006 to 2026. The WCS outlines planned residential and employment growth along the A350 corridor (including the A429 north of M4 Junction 17 to Malmesbury), which will likely increase travel demands at M4 Junction 17. Wiltshire Council is currently undertaking a Local Plan Review (see 2.2.3.13).
- 2.2.3.9. The WCS identifies Chippenham as a Principal Settlement in Wiltshire and therefore a key location for future employment and residential development. The Core Strategy outlines the scale of growth in settlements, rather than identifying specific sites for development in Chippenham. For Chippenham. In terms of transport requirements, Core Policy 63 (Transport Strategies) states that packages of integrated transport measures will be developed and implemented to support the “enhanced strategic employment and service roles, and better self-containment” of the principal settlements in Wiltshire.
- 2.2.3.10. The adopted Chippenham Site Allocations Plan (CSAP) (adopted May 2017) identifies the specific strategic development sites to support the scale of growth identified in WCS Core Policy 10. The adopted CSAP details the approach to providing for employment and residential development at strategic sites in Chippenham up to 2026.
- 2.2.3.11. Recognising that sections of the A350 carry the highest volume of traffic and Heavy Goods Vehicles (HGV) movements on the county’s non-trunk primary routes, the Core Strategy states that the A350 route will be selectively improved to maintain and enhance journey time reliability. This is with the

<sup>9</sup> Swindon and Wiltshire Growth Zones , Swindon & Wiltshire LEP - <https://cms.wiltshire.gov.uk/documents/s111736/SEP%20Appendix%201.pdf>



aim of aiding employment growth at Chippenham, Melksham, Trowbridge, Westbury and Warminster.

#### Wiltshire Housing Site Allocations Plan

- 2.2.3.12. The Wiltshire Housing Site Allocations Plan (WHSAP) was published in February 2020<sup>10</sup>. It reports housing completions between 2006-17, along with developable commitments up to 2026, in order to assess progress towards achieving the housing requirements outlined in the WCS. The Plan corresponds with that of the adopted WCS (covering all of Wiltshire), excluding the area of the CSAP discussed above. The WHSAP outlines considerable planned residential growth along the A350 corridor, which is likely to impact demand at M4 Junction.

#### Wiltshire Local Plan Review

- 2.2.3.13. Wiltshire Council is undertaking a review of the WCS, the Wiltshire Local Plan, which, when adopted, will provide a housing requirement for the Chippenham area between 2016 and 2036. As part of this review, an Emerging Spatial Strategy<sup>11</sup> was published in January 2021. The Local Plan Review is to be adopted in 2023. The document outlines how forecast housing and employment growth will be distributed. A Wiltshire Local Plan Review Development Plan Document (DPD) is currently being developed.
- 2.2.3.14. The Wiltshire Local Plan Review draws upon a number of existing policy documents (including the WCS, CSAP and WHSAP) to develop a strategy for growth for the period between 2016 and 2036 (see Figure 2-3). The Wiltshire Local Plan Review therefore presents the most up-to-date housing and employment requirements for the Wiltshire area.

Figure 2-3 - Relationship between Wiltshire Local Plan Review and existing policy documents



- 2.2.3.15. The Wiltshire Local Plan Review highlights that the Chippenham Housing Market Area (HMA) will continue to perform as a key growth area beyond the current WCS period (i.e. beyond 2026). The Chippenham HMA contains market towns and principal settlements around M4 Junction 17. The planned growth in the Chippenham HMA and across the wider Wiltshire and Swindon plan area would impact on the performance of the existing transport networks across Wiltshire and Swindon.
- 2.2.3.16. Currently the preferred strategy for the Local Plan Review identifies a need for sites to accommodate approximately 46,000 homes and 26 ha of employment land between 2016 and 2036 in Wiltshire. Of these, approximately 25,000 dwellings and 6 ha of employment space are identified for settlements along the A350 corridor. The Local Plan Review identifies a need for approximately 20,000 dwellings up to 2036 within the Chippenham HMA, of which around 9,000 are identified for Chippenham.

<sup>10</sup> [https://www.wiltshire.gov.uk/media/4540/Wiltshire-Housing-Site-Allocations-Plan-Adopted-February-2020/pdf/Wiltshire\\_Housing\\_Site\\_Allocations\\_Plan\\_Adopted\\_February\\_2020.pdf?m=637347424921570000](https://www.wiltshire.gov.uk/media/4540/Wiltshire-Housing-Site-Allocations-Plan-Adopted-February-2020/pdf/Wiltshire_Housing_Site_Allocations_Plan_Adopted_February_2020.pdf?m=637347424921570000)

<sup>11</sup> *Emerging Local Plan*, Wiltshire Council, January 2021

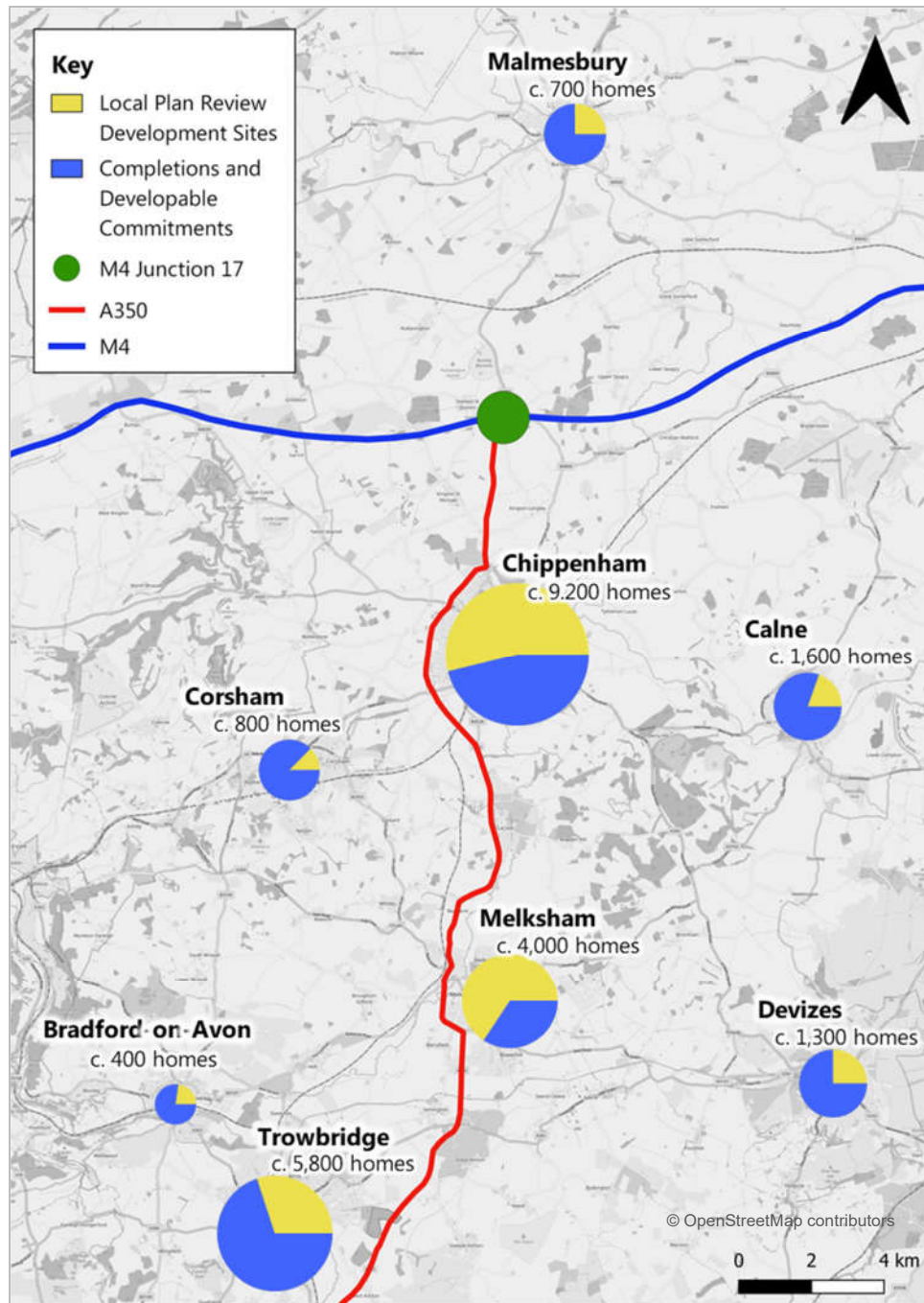
**Table 2-2 - Wiltshire Emerging Spatial Strategy Requirements<sup>12</sup>**

| Area              | Emerging Strategy<br>(2016-2036) | Overall Employment<br>Requirement (Hectares) |
|-------------------|----------------------------------|--|
| Chippenham        | 9,225                            | 5  |
| Corsham           | 815                              | 0  |
| Malmesbury        | 665                              | 0  |
| Melksham          | 3,950                            | 0  |
| Bradford on Avon  | 350                              | 0  |
| Trowbridge        | 5,830                            | 0  |
| Warminster        | 2,050                            | 0  |
| Westbury          | 1,820                            | 1  |
| Rest of Wiltshire | 21,115                           | 20   |
| <b>Total</b>      | <b>45,820</b>                    | <b>26</b>                                    |

2.2.3.17. Figure 2-4 shows the proposed locations for these developments in Chippenham and the surrounding area in the adopted WCS and Local Plan Review. Sites for smaller settlements such as Calne, Devizes and Corsham are yet to have been confirmed. The review outlines considerable residential growth along the A350 corridor beyond the adopted WCS which is likely to result in significant changes in demand at M4 Junction 17 which may require mitigation. Due to M4 Junction 17's role in enabling access between Wiltshire and the SRN, it is important that the junction continues to operate efficiently throughout this period of considerable development and associated increases in demand.

<sup>12</sup> [https://www.wiltshire.gov.uk/media/5623/Emerging-Spatial-Strategy/pdf/Wiltshire\\_Local\\_Plan\\_Emerging\\_Spatial\\_Strategy\\_FINAL.pdf?m=637471655274170000](https://www.wiltshire.gov.uk/media/5623/Emerging-Spatial-Strategy/pdf/Wiltshire_Local_Plan_Emerging_Spatial_Strategy_FINAL.pdf?m=637471655274170000)

Figure 2-4 - Wiltshire Local Plan (2036) proposed development sites - Chippenham



2.2.3.18. Due to M4 Junction 17's role in enabling access between Wiltshire and the SRN, it is important that the junction continues to operate efficiently throughout this period of considerable development and associated increases in demand.

### 2.2.4. Theme 3 - Climate change and carbon emissions

2.2.4.1. In June 2019, parliament passed legislation requiring the government to reduce the UK's net emissions of greenhouse gases by 100% relative to 1990 levels by 2050. Doing so would make the UK a 'net zero' emitter.

- 2.2.4.2. Accelerating the shift to zero emission vehicles is one of the priorities in the race to create an environmentally sustainable economy. Coupled to a commitment to end the sale of new petrol and diesel cars and vans from 2030 (a decade earlier than initially planned), it forms one of the points in the Government's Ten Point Plan for a Green Industrial Revolution, published in November 2020.
- 2.2.4.3. The DfT published 'Decarbonising Transport: Setting the challenge' in March 2020. It had originally expected to release a full Transport Decarbonisation Plan by the end of 2020, but it is now due later in 2021. The plan will set out in detail the actions required to significantly reduce emissions from transport in order to achieve carbon budgets and net zero emissions across all modes of transport in the UK by 2050. The final plan is expected to cover six strategic priorities:
- Accelerating modal shift to public and active transport;
  - Decarbonisation of road vehicles;
  - Decarbonising how we get our goods;
  - Place-based solutions;
  - UK as a hub for green transport technology and innovation; and
  - Reducing carbon in a global economy.
- 2.2.4.4. In February 2019 Wiltshire Council resolved to acknowledge a climate emergency and to seek to make the county carbon neutral by 2030. A Global Warming and Climate Emergency Scrutiny Task Group was set up to gather evidence and come up with recommendations on achieving net zero. A commitment was also made to make the council carbon neutral by 2030. A new climate strategy is being prepared to enable the Council to meet these commitments
- 2.2.4.5. Wiltshire Council's current LTP supports the improvement of alternative modes of travel to the private car. The LTP is currently under review and will seek to align with the targets relating to carbon neutrality.

## 2.2.5. Policy review summary

- 2.2.5.1. The policy review has informed identification of Problem 1. Note that the implications of future growth relating to the planning policy documents outlined is presented in Chapter 3.

**Problem 1 - Strategic role of the A350 (MRN) is threatened by increasing congestion, with potential negative connectivity and economic impacts for West Wiltshire.**

## 2.3. Current travel demands and level of service

- 2.3.1.1. A 2019 validated Vissim microsimulation model, developed by Jacobs, has been reviewed to understand the operational performance of the junction. The Vissim model has been thoroughly validated to observed journey time data and is therefore a reasonable tool to provide an overview on the operation of M4 Junction 17s operation in 2019 (prior to COVID19). Results from the model have been extracted in the form of acceptable speed plots. The acceptable speed statistic is the ratio between average journey times in free flow traffic and average journey times in a scenario. The free flow speed, input into the acceptable speed calculation, includes delay as a result of signalised junctions, give-ways and geometries. This statistic has been used to produce plots for the base morning and evening peak modelled scenario, to illustrate where congestion is occurring in the network.
- 2.3.1.2. The morning peak acceptable speeds plot is shown in Figure 2-5. The plot illustrates that the 2019 base Vissim model predicts delays on the A350 and A429. The evening peak acceptable speed plot is shown in Figure 2-6. The evening peak plot indicates delays on the A429 approach to the junction with the other arms all operating with small levels of delays.

Figure 2-5 - Morning Peak base model acceptable speed plot

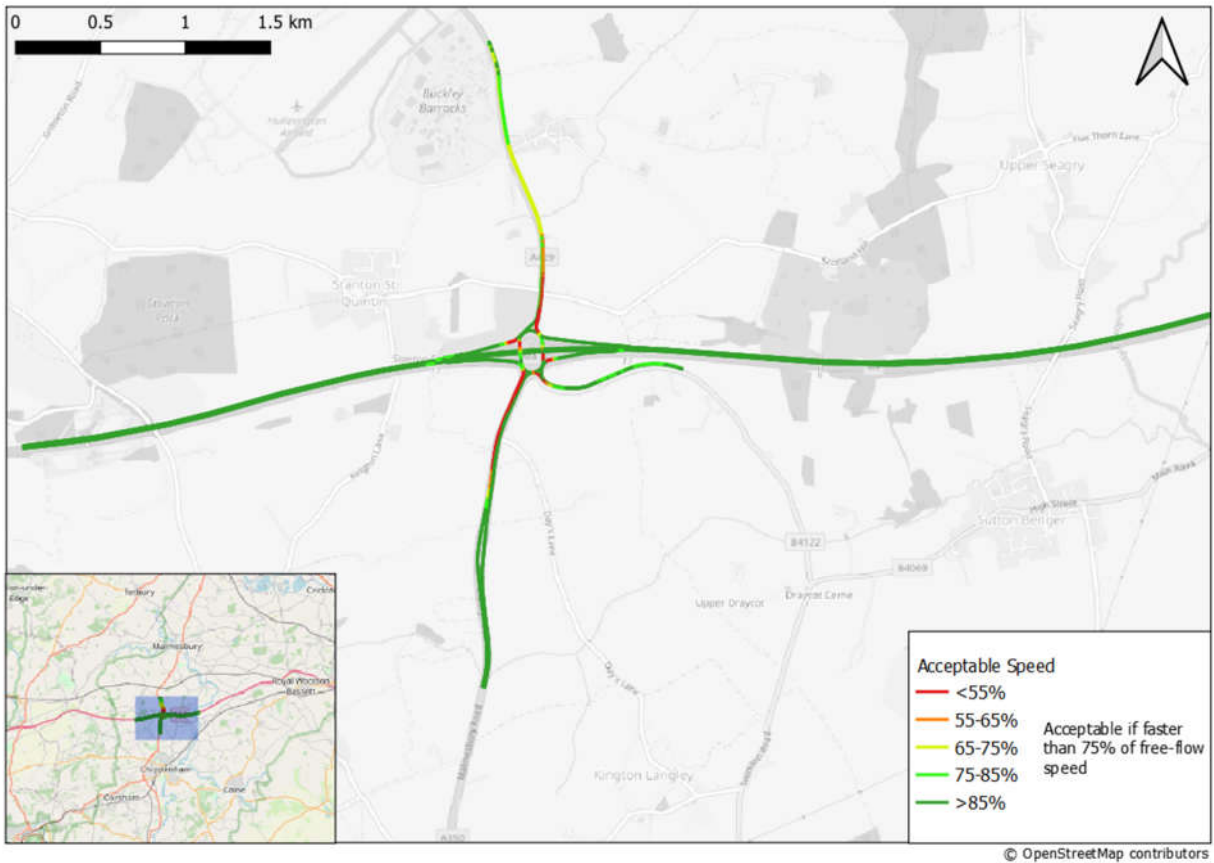
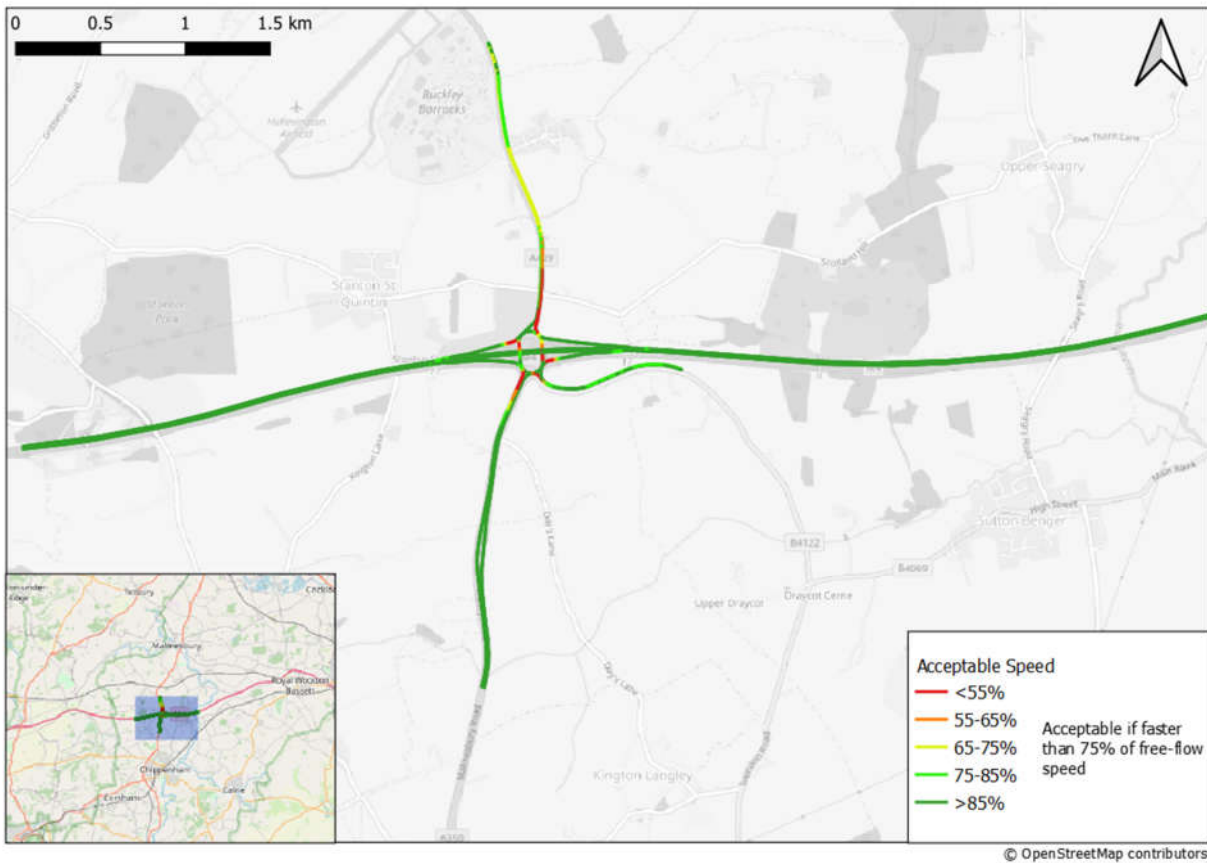


Figure 2-6 - Evening peak base model acceptable speed plot

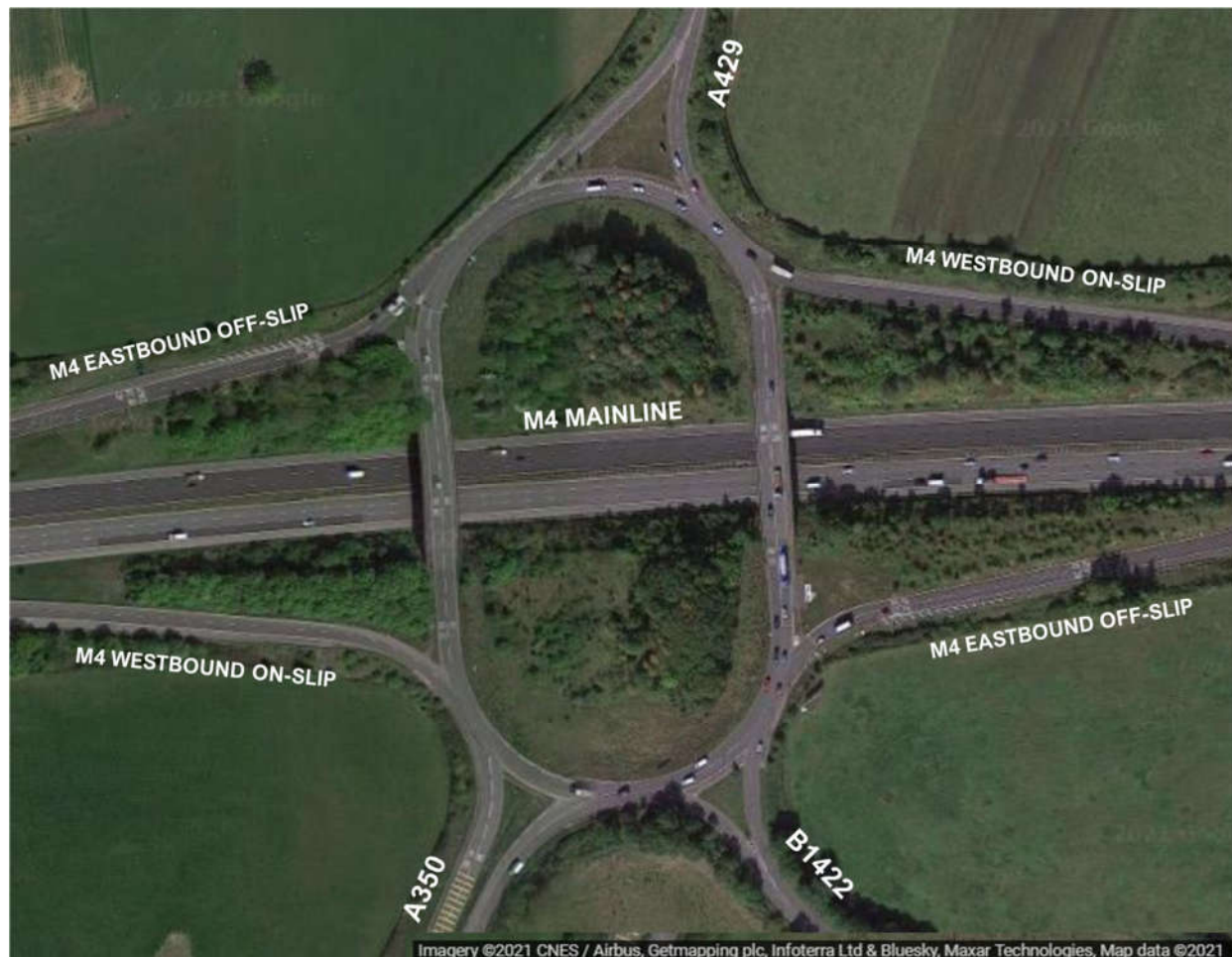


## 2.4. Current network provision

### M4 Junction 17

- 2.4.1.1. M4 Junction 17 comprises five approach arms from the A429 to the north, M4 to the east, B1422 to the south east, A350 to the south and M4 to the west. On both of the approaches to the junction from the M4 there are signals on the off-slip as well as signals on the gyratory to allow traffic to exit the off-slips. The rest of the junction does not currently have any signals. All approaches to the junction have two lanes at the stop line, with the exception of the B4122 approach which only has a single lane. The entirety of the gyratory has two lanes for traffic. An overview of M4 Junction 17 is provided in Figure 2-7.

Figure 2-7 - Aerial photograph of M4 Junction 17



- 2.4.1.2. Improvement works were completed at M4 Junction 17 in May 2018 as part of a LGF scheme. Capacity enhancements were delivered through partial signalisation of the M4 eastbound and westbound off-slips and the gyratory to reduce instances of queuing on the M4 mainline.
- 2.4.1.3. The key objectives of the previously delivered scheme comprised:
- Reduce instances of queues occurring on the M4 mainline;
  - Minimise delays at the junction, specifically on the M4 off-slip eastbound in AM peak and M4 off-slip westbound in PM peak;
  - Reduce the total amount of collisions and accidents that occur at the junction; and
  - Improve the capacity of the junction to deal with congestion impacts of future developments.

#### [Provision for walking, cycling and horse-riding at M4 Junction 17](#)

- 2.4.1.4. At M4 Junction 17 there are limited facilities for pedestrians, and no dedicated infrastructure for cycling or horse-riding. A footway, approximately 1.8 metres in width, runs around the nearside of the roundabout gyratory, connecting to two maintenance areas (by the traffic signals). On both overbridges, the footway runs between the vehicle restraint barrier and bridge parapet.
- 2.4.1.5. The only arm of the junction which has a footway connecting to M4 Junction 17 is the northbound carriageway of the A350, where a footway (with a surfaced width of approximately 1.8m, but is overgrown so effective width is around only 1 metre) runs for around 475 metres to the south (to a small industrial estate housing the Chippenham Pallet Company). At this point however the footway stops and does not link to any onward walking routes.

2.4.1.6. Dropped kerbs are present at each of the crossings of the arms of M4 Junction 17, with tactile paving only at the B4122 entry and exit arms. It is unclear why the B4122 crossings have tactile paving when the other arms of the junction do not, and there is no onward footway along the B4122. Overall the M4 J17 pedestrian facilities are isolated and do not connect to a wider footway network.

**A350 from M4 Junction 17**

2.4.1.7. From M4 Junction 17, the A350 runs south 4km to the Malmesbury Road roundabout on the northern outskirts of Chippenham. This section is now fully dualled following the completion of a Local Pinch Point scheme in 2015. The route then bypasses Chippenham to the west and forms the western boundary of the town. This 6km section from Malmesbury Road roundabout to Lackham roundabout includes five other roundabout junctions, which include the junctions with the A420 to Bristol at Bumpers Farm Roundabout and the A4 to Corsham and Bath at Chequers roundabout. These junctions also provide accesses to residential, employment and retail areas of Chippenham.

2.4.1.8. Heading north from M4 Junction 17 the single-carriageway A429 runs north through the village of Lower Stanton St Quintin and past Hullavington Airfield, the site of Dyson's technology campus. The A429 then heads north-east through Corston towards Malmesbury and Cirencester - 5 miles and 17 miles from M4 Junction 17 respectively.

2.4.1.9. Major improvement works have been undertaken along the A350 in three phases since 2013 (see Table 2-3). The schemes were implemented with the intention of improving journey time reliability and in turn unlocking housing development. An OBC is currently under consideration for Phases 4 and 5 of the A350 Chippenham Bypass improvements.

**Table 2-3 - A350 improvement schemes completed in Chippenham as of March 2021**

| Scheme Name  | Completion and funding   | Description  |
|--|--|--|
| <b>Phase 1:</b> A350 North of Chippenham                                 | Completed: March 2015<br>£3m scheme partly funded through the Local Pinch Point Fund | <ul style="list-style-type: none"> <li>Widening A350 between the Badger roundabout and Malmesbury Road roundabout to dual two-lane</li> <li>Minor adjustments to the entry/exit arms to the south of Badger roundabout</li> <li>Upgrading Malmesbury Road roundabout</li> <li>Widening A350 southbound between Jackson's Lane and Malmesbury Road roundabout to two-lane</li> </ul>  |
| <b>Phase 2:</b> Bypass Improvements (Bumpers Farm)                       | Completed: February 2016<br>£3.4m scheme partly funded through the LGF               | <ul style="list-style-type: none"> <li>Widening the A350 to dual two-lane between Brook and Bumpers Farm roundabout</li> <li>Additional widening of the A350 for ~ 250 metres north of Brook to allow for a suitable merge length back to single lane and two southbound lanes for 100 metres approaching Brook</li> <li>Widening to dual two-lane on a short stretch of the A350 immediately south of Bumpers Farm roundabout</li> <li>Minor widening of the Bumpers Farm Industrial Estate entry arm to Bumpers Farm roundabout</li> </ul> |
| <b>Phase 3:</b> Chippenham Bypass Improvements (Badger-Brook & Chequers) | Completed: November 2018<br>£7m scheme partly funded through the LGF                 | <ul style="list-style-type: none"> <li>Dualling the gap between pinch point improvements (Phase 1) and the Bumpers Farm improvements (Phase 2)</li> <li>Dualling the A350 between a point 250m north of Cepen Park South roundabout and a point 250m South of Chequers roundabout</li> <li>Widening of the A4 westbound approaches and exits at Chequers roundabout</li> </ul>   |



## 2.4.2. Current demand at M4 Junction 17

2.4.2.1. Table 2-4 provides information on average weekday traffic flows, including the percentage of heavy good vehicles, at M4 Junction 17 using the most recent pre-Covid neutral survey month data from WebTRIS.

**Table 2-4 - Weekday Average Traffic conditions at M4 Junction 17 (September 2019)<sup>13</sup>**

|                       | Traffic Flow by Period |           |          | 12-hour Traffic Flow |      |
|-----------------------|------------------------|-----------|----------|----------------------|------|
|                       | AM (7-10)              | IP (10-4) | PM (4-7) | Flow                 | %HGV |
| M4 eastbound on-slip  | 826                    | 459       | 627      | 7,109                | 9.0  |
| M4 eastbound off-slip | 791                    | 461       | 722      | 7,306                | 16.4 |
| M4 westbound on-slip  | 744                    | 490       | 700      | 7,268                | 9.2  |
| M4 westbound off-slip | 629                    | 484       | 793      | 7,169                | 11.3 |
| M4 westbound mainline | 1,894                  | 2,418     | 2,641    | 28,109               | 14.8 |
| M4 eastbound mainline | 2,515                  | 2,343     | 2,266    | 28,399               | 17.7 |

Source: WebTRIS – September 2019

### Weekday average

- 2.4.2.2. There is tidal flow on M4 mainline, with more traffic travelling eastbound in the AM, and more traffic moving westbound in the PM. Traffic flows during the interpeak remain relatively high on the mainline, with considerably less traffic travelling westbound in the AM compared to any other time or direction.
- 2.4.2.3. Of the traffic traveling from the A350, A429 and B1422, 826 vehicles use the M4 eastbound on-slip, and 744 use the westbound on-slip. Of traffic accessing the junction from the M4, 791 enter the junction from the east, with 629 approaching from the west.

### 12-hour flows

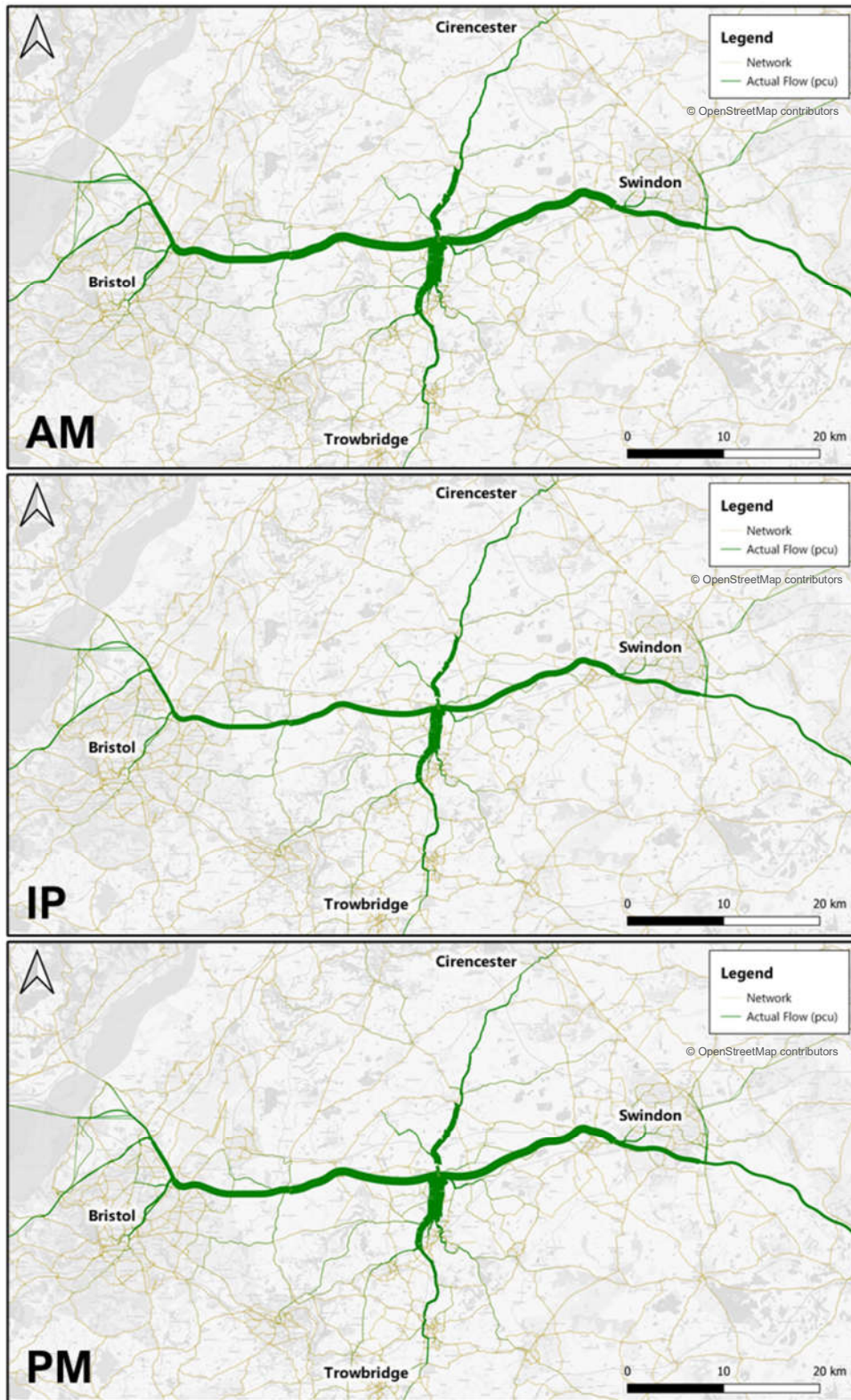
- 2.4.2.4. Overall, the volume of traffic using the motorway on/off-slips at M4 Junction 17 during the day is relatively uniform. Of traffic exiting the M4 from Junction 17, slightly more is traveling from an eastbound direction. Of traffic accessing the M4 at Junction 17, slightly more is heading in the westbound direction. The majority of HGVs approach M4 Junction 17 from the east.
- 2.4.2.5. The large proportion of HGVs using the M4 off-slips reflect the strategic importance of the junction as an intersection between the M4 east-west corridor and the A350 north-south corridor.

### Select link analysis

- 2.4.2.6. Figure 2-8 displays the origin and destination of traffic at M4 Junction 17 from the Wiltshire Transport Model's 2018 base year. These plots demonstrate that M4 Junction 17 is important for strategic traffic, enabling longer-distance east-west trips to and from cities such as Bristol, Swindon, Reading and London (and to a lesser extent Oxford and Bath) in addition to north-south trips to and from more locally important employment areas such as Melksham and Trowbridge and Cirencester. A considerable proportion of traffic using M4 Junction 17 also uses the A350, predominantly originating or terminating at Chippenham, with a smaller number of trips from Melksham and Trowbridge.

<sup>13</sup> WebTRIS <http://tris.highwaysengland.co.uk/detail/journeytimedata>

Figure 2-8 - Select link analysis of traffic approaching and exiting to M4 Junction 17



### 2.4.3. Travel times

2.4.3.1. Travel time data indicates the current and historic performance of M4 Junction 17 in terms of travel time along the M4 off-slips.

2.4.3.2. Average travel times at the off-slips between January and April in 2017 (before the Local Pinch Point scheme improvements) and 2019 (after the LGF scheme was delivered) are presented by time period in Table 2-5. Figure 2-9 and Figure 2-10 displays this visually for eastbound and westbound traffic respectively.

2.4.3.3. The travel times are split into four time periods:

- AM (07:00 – 10:00);
- Inter-peak (IP) (10:00 – 16:00);
- PM (16:00 – 19:00); and,
- Off-peak (19:00 – 07:00).

**Table 2-5 - Travel time (seconds) at M4 Junction 17 off-slips<sup>14</sup>**

| Location           | Length (m) | Year | Time period |    |    |          |
|--------------------|------------|------|-------------|----|----|----------|
|                    |            |      | AM          | IP | PM | Off-peak |
| Eastbound off-slip | 447        | 2017 | 63          | 25 | 32 | 20       |
|                    |            | 2019 | 36          | 32 | 32 | 25       |
| Westbound off-slip | 487        | 2017 | 22          | 20 | 64 | 19       |
|                    |            | 2019 | 39          | 36 | 39 | 31       |

2.4.3.4. The junction currently operates with fairly consistent travel times across the four time periods, with average travel times for the first four months of 2019 varying by 11 seconds on the eastbound off-slips, and 9 seconds on the westbound off-slips.

2.4.3.5. This compares with a variation of 43 seconds and 44 seconds for the eastbound and westbound off-slips respectively, during the first four months of 2017 (before the scheme was delivered).

<sup>14</sup> WebTRIS <http://tris.highwaysengland.co.uk/detail/journeytimedata>

Figure 2-9 - M4 Junction 17 eastbound off-slip travel time

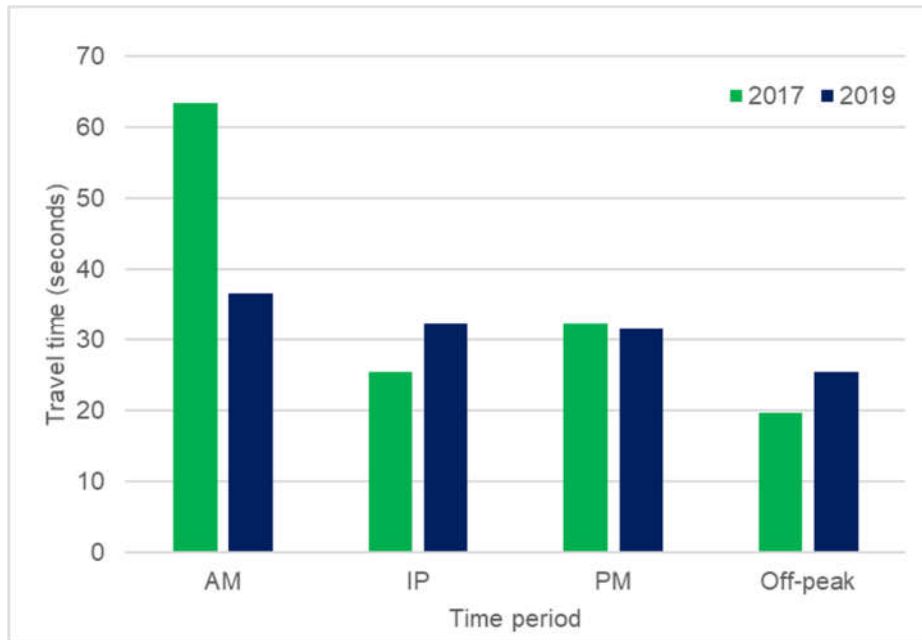
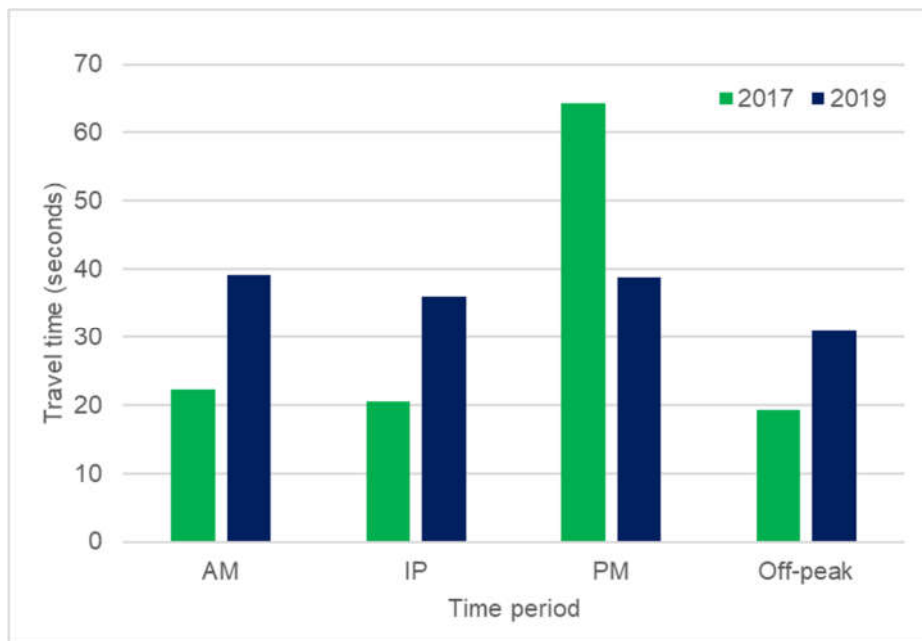


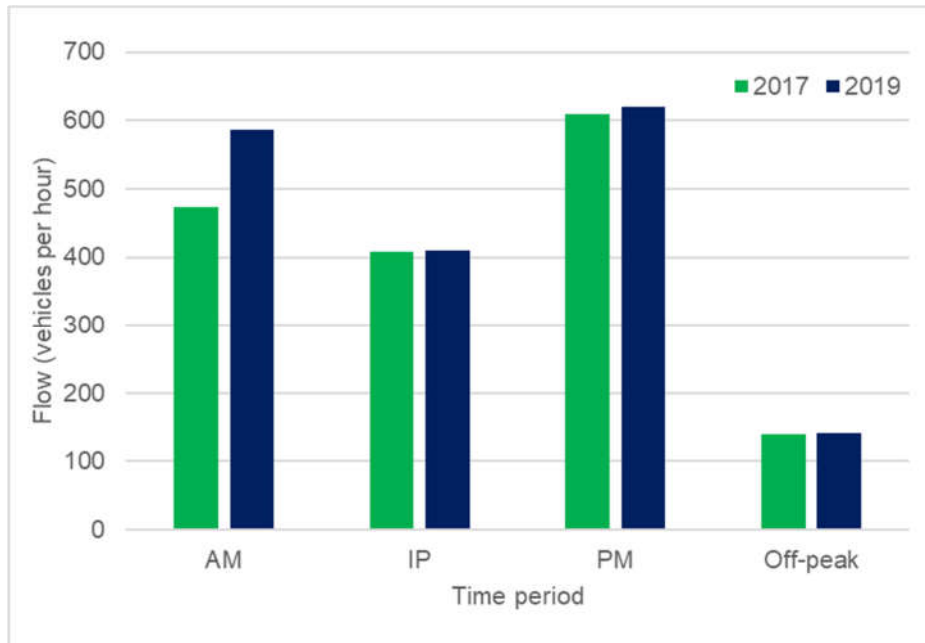
Figure 2-10 - M4 Junction 17 westbound off-slip travel time



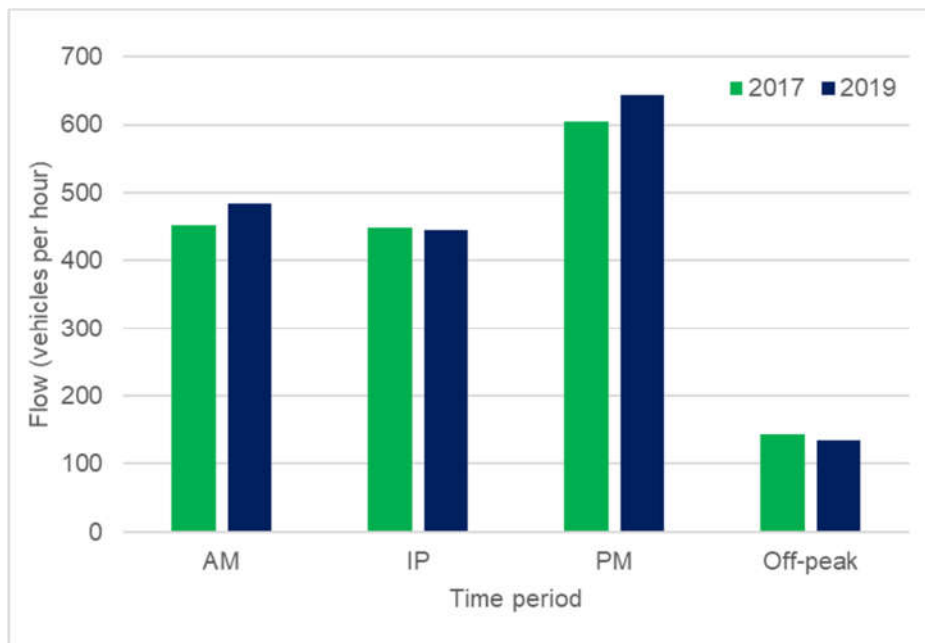
- 2.4.3.6. The LGF scheme has therefore delivered a considerable improvement in the consistency of travel times for users exiting the M4 at Junction 17. The reduction in travel times, particularly during peak periods (e.g. AM on the eastbound off-slip and PM on the westbound off-slip), ensures a smoother flow of traffic off the M4.
- 2.4.3.7. Previous evidence compiled for the original business case highlighted the presence of queuing backing on to the mainline M4 which presented a considerable safety risk.
- 2.4.3.8. Figure 2-11 and Figure 2-12 present flow data for the same periods, which indicates that there is a relatively consistent level of flows on the off-slips.

2.4.3.9. There has, however, been increases in flow on the eastbound off-slip during the AM period and a minor increase in flows on the westbound off-slip during AM and PM periods.

**Figure 2-11 - M4 Junction 17 eastbound off-slip vehicle flows**



**Figure 2-12 - M4 Junction 17 westbound off-slip vehicle flows**



#### Collisions

2.4.3.10. In the six-year period between January 2014 and December 2019 inclusive, 40 collisions were recorded in the study area with noticeable collision clusters at the M4 off-slips. Of these 40 collisions, 36 were classified as 'slight', 3 as 'serious' and 1 as 'fatal'. The single fatal collision occurred on the M4 mainline. The location of the collisions are displayed in Figure 2-13.

2.4.3.11. 32 collisions were recorded between January 2014 and April 2018 - before the M4 Junction 17 LGF scheme was delivered in May 2018. Eight collisions have been recorded between May 2018 and

December 2019 since the delivery of the scheme, five of which took place at the junction. All five of these accidents were associated with unsignalised arms of the junction; three occurring on the A350 arm, one on the B1422 arm, and one at the A429 arm. Both the B1422 and A350 arms have been key cluster sites between 2014 and 2019.

- 2.4.3.12. Table 2-6 displays the collision frequency rate. It should be noted that the success of the LGF scheme in terms of safety cannot be concluded at this stage, due to the small evaluation window.

**Table 2-6 - Collision frequency**

|  | Before scheme<br>(Jan 2014 to April 2018) | After scheme<br>(May 2018 to Dec 2019) |
|--|---|--|
| Number of collisions                       | 32  | 8                                      |
| Collision frequency (collisions per month) | 0.7                                       | 0.4                                    |

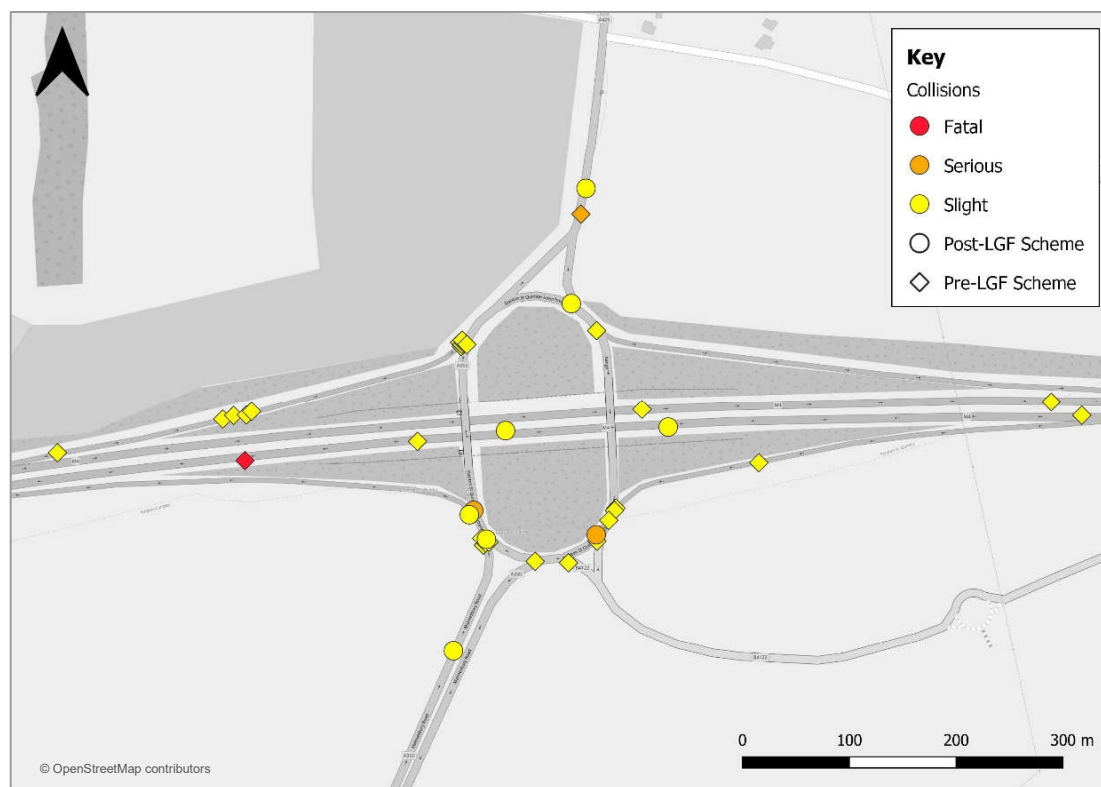
- 2.4.3.13. Table 2-7 benchmarks collisions at M4 Junction 17 against the adjacent junctions. This analysis accounts for collisions at the junction based on the circulatory and the approaches. This table demonstrates the impact of the LGF scheme at M4 Junction 17, reducing the monthly accident rate from 0.5 to 0.2 for the period before and after the scheme respectively. The collision rate at M4 Junction 17 is similar to the rate at Junction 16 to the east and Junction 18. It is anticipated that the plans to signalise the other arms will help to reduce the clusters at M4 Junction 17.

**Table 2-7 – Collisions benchmarking (2014-2020)**

|                | Before scheme<br>(Jan 2014 to April 2018) |                      | After scheme<br>(May 2018 to Dec 2019) |                      |
|----------------|---|----------------------|--|----------------------|
|                | Collisions at the junction                | Collisions per month | Collisions at the junction             | Collisions per month |
| M4 Junction 16 | 16  | 0.3                  | 3                                      | 0.2                  |
| M4 Junction 17 | 26  | 0.5                  | 4                                      | 0.2                  |
| M4 Junction 18 | 5   | 0.1                  | 2                                      | 0.1                  |

- 2.4.3.14. The LGF scheme has helped resolve issues for existing levels of traffic by improving peak period traffic flow and improving safety. However, there is a rationale to deliver an enhanced scheme with a considerable increase in capacity at the junction, in order to successfully mitigate the impacts of substantial planned residential and employment growth requirements.

Figure 2-13 - Collision locations (2014 to 2019)



2.4.3.15. The review of traffic and collision data has informed identification of Problem 2:

*Problem 2 - Operational and safety performance of the M4 (SRN) is threatened by growth in demand at M4 J17.*

## 2.5. Constraints

### 2.5.1. Environmental constraints

2.5.1.1. This section provides a high-level baseline review of the environmental sensitivity of the M4 Junction 17 scheme area, covering biodiversity, noise, air quality, landscape, heritage, water environment, and geology and soils. The environmental constraints are based on publicly available datasets only and also do not consider social and wider sustainability principles. An environmental constraints plan is provided in Figure 2-14.

Figure 2-14 - Environmental constraints map



**Environmental Constraints Plan**

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#### Biodiversity

- 2.5.1.2. Stanton St Quinton Quarry and Motorway Cutting Site of Special Scientific Interest (SSSI) crosses both carriageways of the M4 at Junction 17. This site is designated as a SSSI for geological reasons and could be potentially impacted by engineering works, but is not considered further in respect of biodiversity. There are no statutory designated sites of nature conservation importance within 2 km of M4 Junction 17.
- 2.5.1.3. M4 Junction 17 lies within a Priority Species area for Countryside Stewardship for lapwing habitat.
- 2.5.1.4. There are also several areas of ancient woodland within 2km of M4 Junction 17 but none in the immediate vicinity. These are located approximately 1.6km to the west of M4 Junction 17 and 1.8km to the east. Ancient woodland are irreplaceable features which have had woodland cover for centuries and have been relatively undisturbed by human activity dating back to 1600. These areas can be high in biodiversity or cultural value. As a habitat type, ancient woodland has no statutory protection per se, but it is explicitly mentioned in planning policy in the UK and as irreplaceable habitats should be avoided completely.
- 2.5.1.5. There are several areas of deciduous woodland (Priority Habitat) within 2km, 13 of which are within 1km, with two small areas within 200m (one of which is within the central area of the junction on the north side of the M4). Deciduous woodlands are Priority Habitats under the Natural Environment and Rural Communities Act (2006) Section 41 Habitats of Principal Importance. Species and habitats have been identified in these areas as being of principal importance for the conservation of biodiversity in England and Wales and therefore require conservation action. Priority Habitats and Species need to be protected from development through avoidance where practicable.
- 2.5.1.6. The motorway soft estate within M4 Junction 17 includes linear belts of trees and shrubs, and areas of open grassland. There are hedgerows present within surrounding agricultural habitats. These habitats may support protected species such as bats, badger and dormice. A Phase 1 survey and a Preliminary Ecological Appraisal Report will be produced to provide more detail of the Biodiversity sensitivity of the scheme in the OBC.

#### Noise

- 2.5.1.7. There are no Noise Important Areas (NIA) adjacent to M4 Junction 17 but there are two NIAs within approximately 1km of Junction 17; one to the south on the A350 and one to the north on the A429. NIAs are locations where the 1% of the population most affected by the highest noise levels from major roads and railways are located according to the strategic noise mapping undertaken by the Department of Environment, Food and Rural Affairs (DEFRA). Therefore, NIAs are those with existing high noise levels. Exacerbating noise levels in these areas may adversely impact sensitive human receptors and populations (e.g. young and elderly in concentrations such as schools and hospitals). Areas designated as NIAs should therefore be avoided where the proposed development could further exacerbate noise and vibrations levels. There are approximately 15 noise sensitive receptors (NSR) within 600m of M4 Junction 17.

#### Air Quality

- 2.5.1.8. M4 Junction 17 is not located within an AQMA. There are less than 10 human health receptors within 200m of M4 Junction 17. There are no designated ecological sites within 200m of M4 Junction 17.

#### Landscape

- 2.5.1.9. M4 Junction 17 is located within the rural landscape of the Thames and Avon Vales National Character Area, approximately 3.8km to the north of the urban edge of Chippenham. M4 Junction 17 is located within the existing road corridors and contained within the existing highway boundaries to the A429, the A350 and B4122. There are existing hedgerows, woodland and linear tree and shrub belts in close proximity to M4 Junction 17 that provide screening for the close by urban areas and surrounding villages. Hedges and trees on embankments / bunds are likely to be affected by any road pavement widening.
- 2.5.1.10. The site does not lie within or adjacent to a national Landscape Designation (e.g. Area of Outstanding Natural Beauty) and there are none within 2km of the site. There are no registered Parks & Gardens within 2km of the site. The Stanton St Quintin Quarry and Motorway Cutting SSSI (geological reason for designation) is within the central area of the junction itself, with the designation continuing under the M4 carriageway.

- 2.5.1.11. There are trees covered by TPOs approximately 550m, 840m and 1.2km to the east, and 1.1km to the west of the site but none in the immediate vicinity.

#### Heritage

- 2.5.1.12. There are no World Heritage Sites, Registered Parks and Gardens, Registered Battlefields, or Conservation Areas within 1km of M4 Junction 17. There is one Scheduled Monument, Dovecote at The Manor (1018612), located approximately 1km west of M4 Junction 17. There is one Grade II\* and eight Grade II listed buildings located in the village of Stanton St. Quintin, approximately 1km west of M4 Junction 17.

#### Water Environment

- 2.5.1.13. An unnamed Environment Agency main river crosses the M4 approximately 500m west of Junction 17. The Flood Zone 3 (1% Annual Probability (AP)) extent of this river is 300m west of Junction 17, and the Flood Zone 2 (0.1% AP) extent extends onto the M4 at Junction 17, underneath the proposed works on the A350/A429 (the M4 runs approximately 7m underneath the junction).
- 2.5.1.14. A minor, unnamed watercourse 100m to the south of Junction 17 flows east to join the River Avon but has no flood zones for its uppermost reach. The River Avon and its Flood Zone 3 extent lie approximately 3.3km and 3km to the east, respectively.
- 2.5.1.15. There is one minor watercourse and drainage ditch within 500m of M4 Junction 17 located approximately 300m west and 230m south within agricultural fields. There are two small ponds located approximately 360m to the northeast of M4 Junction 17 within an agricultural field and separated from M4 Junction 17 by a minor road.
- 2.5.1.16. At M4 Junction 17 the surface water flood risk is Very Low. There is no fluvial flood risk at M4 Junction 17. Groundwater plays an important role in both flood risk and water supply. The Environment Agency publishes groundwater protection zone and groundwater vulnerability maps. There are no Groundwater Source Protection Zones underlying M4 Junction 17. Although there are no recorded flood events caused solely by groundwater in the study area, groundwater flows still play an important role during wet weather periods.

#### Geology and Soils

- 2.5.1.17. The bedrock geology underlying M4 Junction 17 is mudstone, siltstone and sandstone (Kellaways and Oxford Clay formations - undifferentiated). There is also fault line (fault at rock head) running through the central area of the junction on the south side of the M4. There are no superficial geological deposits underlying M4 Junction 17. The Stanton St Quinton Quarry and Motorway Cutting SSSI is located within the footprint of the works area, which crosses both carriageways of the M4 at Junction 17.

## 2.5.2. Engineering constraints

#### Overview

- 2.5.2.1. This section provides a high-level baseline review of engineering constraints at M4 Junction 17 against the following topics: land, topography, bridge structure load capacity and condition, highway geometry, traffic signals, vehicle restraint systems, street lighting, constraints on the approaches, drainage and utilities.

#### Land

- 2.5.2.2. The scheme shall be delivered in partnership between Wiltshire Council and Highways England as permitted development; additional land shall only be used for temporary easement for construction, if required.

#### Topography

- 2.5.2.3. Full topographical data is not currently available. Scheme option designs will be based on Ordnance Survey data with assumed existing side slopes of a 1 in 2 gradient. To retain constructed works within the highway boundary reinforced earthworks slopes may be required depending on the option progressed.

#### Bridge structure load capacity and condition

- 2.5.2.4. For option development and assessment it is assumed that the overbridges have the structural capacity to accept standard and special vehicle loading as per DMRB standards. It is assumed that structural alterations to the junction are outside the scale of funds available through the MRN fund.
- 2.5.2.5. It is assumed that any planned bridge structure maintenance works will be completed prior to the MRN scheme and would be funded by Highways England's maintenance budgets.

#### Highway geometry

- 2.5.2.6. Where options require additional lanes across the overbridges, parallel movements of HGV's may restrict full use of the additional lanes. Operational modelling will consider this constraint and present realistic traffic flow forecasts through the junction for fair option comparison.
- 2.5.2.7. Constraints to potential merge / diverge upgrades include available land, the Stanton / Kington Lane bridge underpass 700m to the west of junction 17 and a farm accommodation bridge 1600m to the east.
- 2.5.2.8. The A350 to the south of the junction has substandard segregated right turning lanes into side roads, businesses and residential dwellings. The right turning lane from the A350 northbound into Day's Lane is located approximately 400m to the south of Junction 17 and may restrict the extent of A350 carriageway widening.
- 2.5.2.9. Laybys on the A350 and A429 are located in close proximity to M4 Junction 17. The A429 layby is 150m north of junction 17. The A350 layby is 140m south of junction 17. Depending on required lengths of entry widening these laybys may be affected and require relocating.
- 2.5.2.10. A crossroads junction of the A429 and C27 is located 240m north of junction 17. Queue lengths will be reviewed to assess impact on this junction.

#### Vehicle Restraint Systems

- 2.5.2.11. Existing Vehicle Restraint Systems have existing geometry departures from standard, necessary due to restricted loading limits of cantilevered sections of bridge structure in front of the bridge parapets.

#### Drainage

- 2.5.2.12. Drainage discharge rates and locations of outfalls will need to be agreed with Highways England and Wiltshire Council; locations for attenuation shall be identified within the highway boundary.

#### Traffic Signals

- 2.5.2.13. Traffic signals at the junction are maintained by Highways England. Slip road queue loops may need to be relocated as part of the scheme.

#### Street lighting

- 2.5.2.14. All of the street lighting at M4 Junction 17 is maintained by Wiltshire Council. Capacity of the Distribution Network Operator (DNO) street lighting power supply at the junction is not known. Where scheme options require carriageway widening, an allowance for street lighting amendments will be included. The maximum queue lengths indicated in the traffic models will also be considered for the amendments to street lighting extents. Additional street lighting power requirements may require extensive extension of low voltage supply mains. An early quotation for new supplies from the Distribution Network Operator (DNO) is recommended.

#### Utilities

- 2.5.2.15. Utility services will require diversion / protection. A full NRSWA process up to C3, preliminary diversion / protection estimates will be undertaken, during preliminary design, post OBC submission.

## 2.6. Opportunities

- 2.6.1.1. In addition to the physical and environmental constraints outlined in Section 2.5, current and future opportunities have been identified. These opportunities set out the context for the subsequent review of the future situation:

- M4 Junction 17's role in supporting economic growth on the A350;
- Unlocking significant future housing growth in Chippenham; and
- Building upon the phased improvements on the A350 around Chippenham and complementing the current Wiltshire MRN programme.

2.6.1.2. Improvements to the M4 corridor in Wiltshire and Swindon represent an opportunity to build on the concentration of research and development communications industries in the area to reinvigorate the corridor's reputation. There are major opportunities to attract new investment around the main junctions and in the nearby towns of Swindon, Chippenham, Corsham, Malmesbury and Royal Wootton Bassett. Demand is driven in part by businesses looking to move along the M4 from London searching for more space, relatively lower costs and the benefits of good strategic transport links. In terms of the longer term role of the A350, Highways England RIS2 funding has been allocated to a north-south connectivity study.

2.6.1.3. Planned growth in north Wiltshire, particularly at the 'principal' settlement of Chippenham, will increase pressure on the M4 Junction 17. Improvements to the junction would subsequently be required through improving capacity to mitigate the impacts of the additional trips on the network.

2.6.1.4. Finally, improvements to M4 Junction 17 will complement several recently delivered local highway improvements on the A350 Chippenham Bypass, facilitating the town's planned development, as well as the planned MRN schemes outlined in Section 1.3. The scheme also has the opportunity to benefit from and build on the M4 Junction 17 LGF scheme delivered in 2018, which provided capacity and safety improvements through partial signalisation of the junction.

## 2.7. Summary

2.7.1.1. This chapter identified transport issues related to the A350's strategic role and operational and safety issues at M4 Junction 17 which will be exacerbated by future growth. Addressing issues at M4 Junction 17 presents an opportunity to support north-south connectivity through the continued phased improvement to the A350. The following key issues have been identified in this chapter:

**Problem 1 - Strategic role of the A350 (MRN) is threatened by increasing congestion, with potential negative connectivity and economic impacts for West Wiltshire.**

**Problem 2 - Operational and safety performance of the M4 (SRN) is threatened by growth in demand at M4 J17.**

## 3. Step 2: Understanding the future situation

### 3.1. Overview

3.1.1.1. In this second step of the recommended TAG process for option development, the future land uses and transport system changes that are likely to affect M4 Junction 17 are established. This builds upon the current policies outlined in Chapter 2. Key issues identified are summarised in text boxes and further explored in Chapter 4 which establishes the need for intervention.

### 3.2. Future land-use

#### 3.2.1. Overview

3.2.1.1. Chippenham and the wider western Wiltshire area is a focus for residential and employment growth. This growth goes beyond that forecasted for the recently delivered M4 Junction 17 LGF scheme and will impact on travel demand and subsequently affect vehicle flows using M4 Junction 17. Growth ambitions are considered in two growth types:

- **Planned growth:** development sites with planning permission or forming part of the WCS (2006-2026). This growth is captured in the Uncertainty Log<sup>15</sup> as certain or near certain; and
- **Future growth:** potential future development sites that are yet to obtain planning permission and do no form part of WCS (2006-2026), and planned development in the Local Plan Review (2016-2036).

3.2.1.2. The WCS sets out planned growth up to 2026, but further future growth plans are currently under consideration as part of the Local Plan Review and would further add to residential and employment growth in the area. Further information on local planning policy documents is provided in Chapter 2.

3.2.1.3. Table 3-1 summarises planned and future growth for Wiltshire based on the policies reviewed in Chapter 2 and planning applications.

**Table 3-1 - Planned and future growth**

| Growth type    | Timescales  | Residential / employment growth  |
|----------------|-------------|--|
| Planned growth | 2006 - 2026 | <ul style="list-style-type: none"> <li>• The <b>WCS</b> sets out the requirement for 42,000 homes and 27,500 jobs.</li> <li>• The Chippenham Community Area is to deliver 4,510 dwellings of the Core Strategy requirement. The CSAP identifies large sites to deliver mixed-use growth:                             <ul style="list-style-type: none"> <li>○ South West Chippenham (1,000 dwellings, 18ha employment land);</li> <li>○ Rawlings Green (650 dwellings, 5ha employment land);</li> <li>○ North Chippenham (750 dwellings, 2.7ha employment land); and</li> <li>○ Hunters Moon (450 dwellings, 2.4ha employment land).</li> </ul> </li> <li>• Other development outside the WCS but are contained in the Uncertainty Log<sup>16</sup> for the Wiltshire Strategic Highway Model. Sites relevant to M4 Junction 17 include:                             <ul style="list-style-type: none"> <li>○ Chippenham Gateway (9.29ha employment space).</li> </ul> </li> </ul> |
| Future growth  | 2016 - 2036 | <ul style="list-style-type: none"> <li>• The <b>Local Plan Review's</b> Emerging Spatial Strategy out the future housing needs in Chippenham and the surrounding area.</li> </ul>  |

<sup>15</sup> An uncertainty log is a list of all planned and forecast infrastructure and development delivery, against a likelihood framework, which is used to predict growth and used to inform modelling and economic scenarios. .

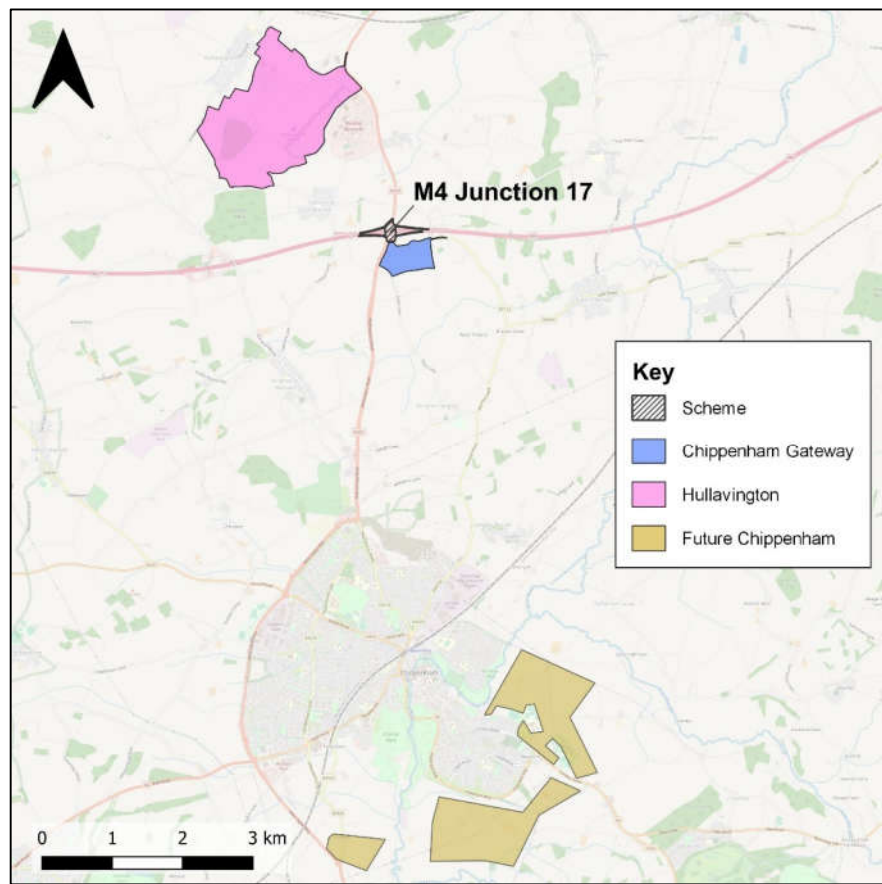
<sup>16</sup> The Uncertainty Log is available in the Appraisal Specification Report (ASR), a supporting document for this SOBC.

| Growth type | Timescales | Residential / employment growth   |
|-------------|------------|---|
|             |            | <ul style="list-style-type: none"> <li>45,600 dwellings in Wiltshire, with 20,400 planned for the Chippenham Housing Market Area (HMA).</li> <li>The Future Chippenham/Chippenham Urban Expansion has been identified as a potential site to deliver a proportion (7,500 dwellings) of the Chippenham HMA's housing needs. 5,100 of these dwellings are included in the Local Plan Review to 2036.</li> <li>Hullavington Airfield (Dyson) (4.42ha development space) – this development has planning permission subject to conditions, but timescales are uncertain.</li> </ul> |

3.2.1.4. A scheme to mitigate Core Strategy growth was delivered at M4 J17 in 2019<sup>17</sup>, however, this scheme does not accommodate for development outside of Core Strategy growth. Accordingly, the following three local developments are likely to impact M4 Junction 17 (Figure 3-1):

- Chippenham Gateway – 9.29ha of B8 employment;
- Hullavington – 2ha of B1 employment, 2.42ha of ancillary development; and
- Future Chippenham – 5,100 – 7,500 dwellings, employment, schools, public open space.

**Figure 3-1 - Key development sites**



<sup>17</sup> M4 Junction 17 Capacity Improvement Scheme FBC, Wiltshire Council - [https://swlep.co.uk/docs/default-source/programmes/local-growth-fund-lgf/full-business-cases/m4-junction-17/m4-junction-17-fbc-20-apr-2017.pdf?sfvrsn=c26988bc\\_4](https://swlep.co.uk/docs/default-source/programmes/local-growth-fund-lgf/full-business-cases/m4-junction-17/m4-junction-17-fbc-20-apr-2017.pdf?sfvrsn=c26988bc_4)

- 3.2.1.5. The Chippenham area is a key focus area for growth in Wiltshire, with substantial housing and employment growth planned. The inability of the transport network to accommodate the additional demand will hinder delivery of housing and employment growth as well as inward investment.

### 3.2.2. Transport schemes associated with key developments

- 3.2.2.1. Both Chippenham Gateway and Hullavington have planning approval and the planned highway mitigation is outlined in Table 3-2. Chippenham Gateway is expected to come forward before the MRN scheme and the timescales for Hullavington are uncertain. These two key planned employment sites near to M4 Junction 17 will bring considerable levels of additional employment to the local area and would require individual schemes to provide enhancements at M4 Junction 17.
- 3.2.2.2. Improvements are also planned as part of the Future Chippenham scheme – however if the MRN bid is successful the associated HIF funding will form the local contribution for the MRN scheme and form a larger improvement. The Future Chippenham scheme comprises widening and signalisation of A350, A429 and B4122 approaches and both northern and southern circulatory and widening of all M4 on/off-slips (see Figure 3-2). Overall a comprehensive solution is needed to cater for future growth that avoids multiple sets of roadworks as developments come forward – user satisfaction is an objective in Highways England’s Strategic Business Plan.
- 3.2.2.3. Furthermore, committed and potential household and employment developments and associated transport mitigations have been incorporated in the core scenario of the Wiltshire Transport Model, as specified in the uncertainty log provided by Wiltshire Council in conjunction with TAG Unit M4. Note Hullavington has been left out of the core scenario due to its uncertainty despite having planning approval.

#### Chippenham Gateway

- 3.2.2.4. Chippenham Gateway (also referred to as St Modwen Park) is located south-east of M4 Junction 17 on the B4122. It comprises of approximately 90,000m<sup>2</sup> of Class B8 (storage and distribution) employment space and associated infrastructure. The site is currently under construction, having been granted planning permission in 2018 with the conditions outlined in Table 3-2. The developer is aiming to start construction of the associated improvements to M4 Junction 17 by the end of 2021 therefore the Chippenham Gateway development and scheme are included in the Wiltshire Transport Model core scenario. Improvements will include widening and signalisation on the A350 and B4122 approaches, and widening and signalisation on the southern gyratory.
- 3.2.2.5. In the event that the MRN scheme comes forward prior to the Chippenham Gateway scheme, the MRN scheme would deliver all improvements associated with the gateway scheme; A Section 106 contribution towards the MRN delivery from the Chippenham Gateway developer would be included in this scenario.

#### Hullavington

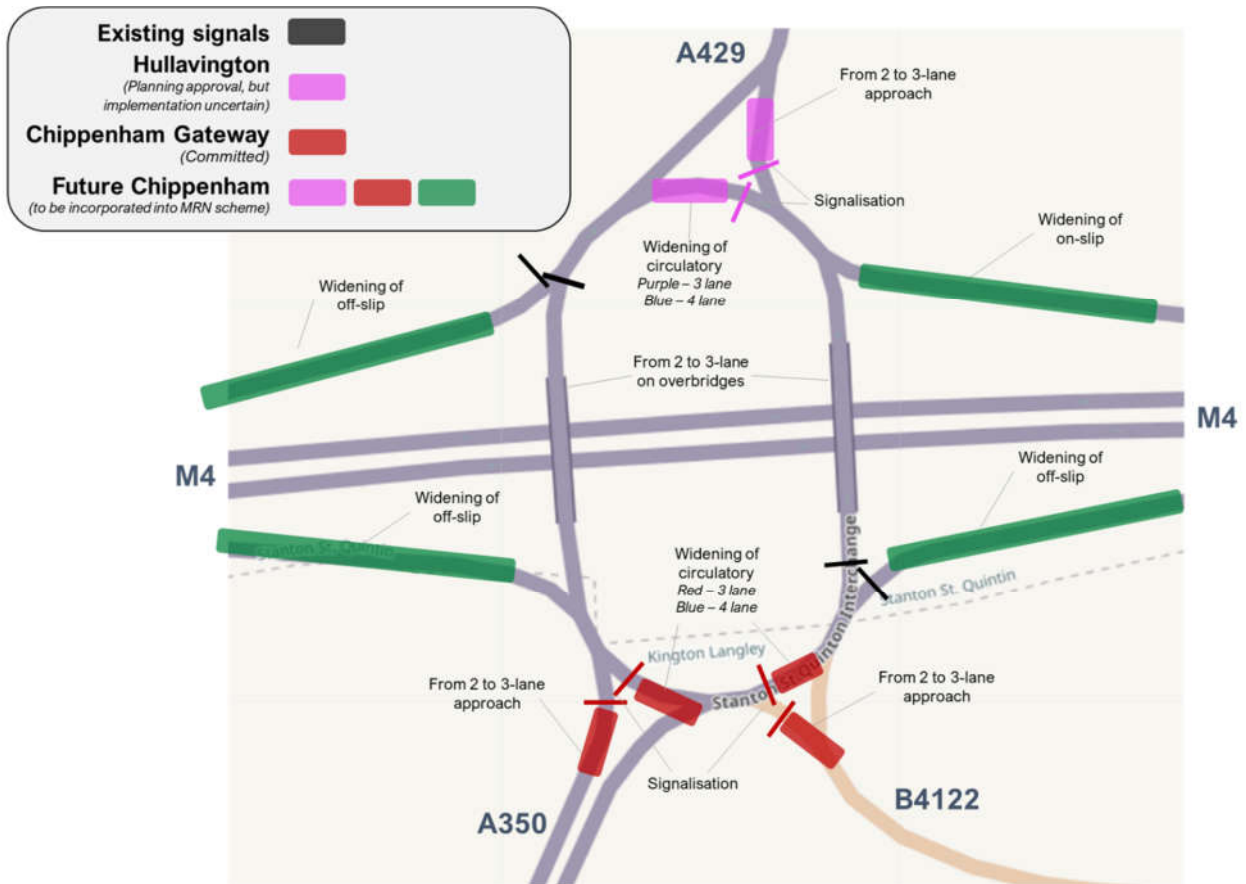
- 3.2.2.6. Dyson submitted a planning application to Wiltshire Council in 2018 for the second phase of development at the former Hullavington Airfield site. Hullavington Airfield is accessed from the A429, north of M4 Junction 17. The expansion will contain 45,000m<sup>2</sup> of research and development and ancillary development space. Associated works planned include widening and signalisation on A429 approach, and widening and signalisation on the northern gyratory. Planning permission was granted on 23rd August 2019 with conditions outlined in Table 3-2.
- 3.2.2.7. The timescales for the Hullavington development are currently uncertain. It is public knowledge that Dyson has cancelled the electric car project, for which they originally sought the 2018 planning permission to accommodate. Due to this uncertainty the Hullavington development and associated mitigation will not be included in the OBC Core Growth modelling. If Dyson came forward with the current scheme then the aim would be for delivery to not conflict with the MRN scheme – if it did conflict then a financial contribution would be sought. Due to this uncertainty the Hullavington development and associated mitigation will not be included within any scenarios of the OBC modelling.

#### Future Chippenham

- 3.2.2.8. The Chippenham Urban Expansion, known as Future Chippenham, is a project planned to deliver 7,500 homes alongside significant community infrastructure on both Wiltshire Council and privately-owned land.

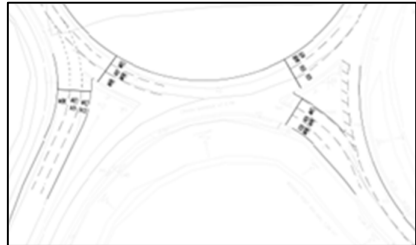
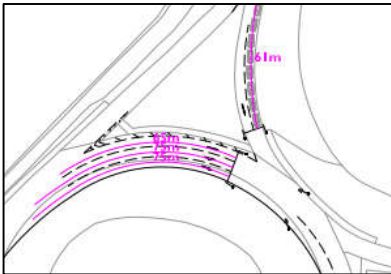
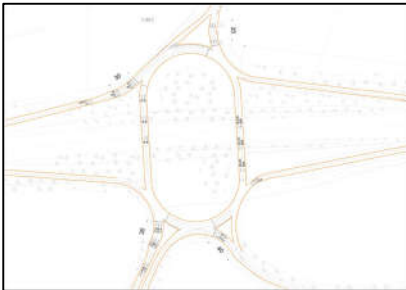
- 3.2.2.9. The project is planned to deliver a considerable proportion of the identified housing need of 9,225 homes in the Chippenham HMA between 2016-2036 and also to support some of the 25,000 homes and 6 ha of employment land on the A350 corridor. Subsequently the delivery of the site would support the delivery of the emerging Local Plan.
- 3.2.2.10. The sites within Wiltshire Council’s ownership and those owned by private developers are included in the Strategic Housing Land Availability Assessment and as such will be considered for selection as part of the Local Plan review site selection process.
- 3.2.2.11. The Chippenham Urban Expansion will contribute to the SWLEP long-term economic ambitions for the Swindon M4 and A350 Growth Zones by providing the housing and employment needed to support growth in these areas.
- 3.2.2.12. A decision has been made that the M4 Junction 17 OBC should be conducted in the context of dependent development relating to the Future Chippenham housing – further information is provided in the Appraisal Specification Report (ASR) Refresh (May 2021). Overall, a comprehensive solution is needed to cater for future growth. This will avoid a piecemeal approach which would cause additional disruption to strategic traffic during construction.

**Figure 3-2 - Planned and committed schemes**





**Table 3-2 - Chippenham Gateway, Hullavington and Future Chippenham M4 Junction 17 mitigations**

|                     | Chippenham Gateway  | Hullavington (note timescales are uncertain)   | Future Chippenham   |
|---------------------|---|--|---|
| Development         | 92,900sqm of employment   | 44,150sqm of employment  | 5,100 – 7,500 dwellings, employment, schools  |
| Planning permission | Granted on 23 <sup>rd</sup> August 2018 (with conditions)   | Granted 23 <sup>rd</sup> August 2019 (with conditions)   | N/A – planning application is yet to be submitted.  |
| Highway mitigation  | <p>Widening and signalisation on A350 and B4122 approaches. Widening and signalisation on southern circulatory.</p>    | <p>Widening and signalisation on A429 approach. Widening and signalisation on northern circulatory.</p>    | <p>Widening and signalisation of A350, A429 and B4122 approaches and both northern and southern circulatory. Widening of all M4 on/off-slips.</p>  |
| Funding             | Developer funded.   | Developer funded.  | To be funded by Future Chippenham is supported by a successful HIF bid. If the MRN bid is successful the HIF funding will form the local contribution for the MRN scheme.   |
| Planning condition  | To ensure the safe and efficient operation of the SRN, mitigation works to M4 Junction 17 to be completed either prior to the occupation of more than 3.25ha (35%) of floorspace on the site, or 5 years from the enforcement of the development. | No development can be occupied until improvement scheme to A429 arm of M4 Junction 17 has been completed and is open to traffic. No more than 0.5ha (11%) to be occupied before the improvement and signalisation scheme identified for M4 Junction 17 - as part of the Chippenham Gateway development - has been completed and approved by the Local Planning Authority and is open to traffic. | N/A – planning application is yet to be submitted.  |

### 3.3. Future transport system changes

3.3.1.1. Planned transport schemes that would directly impact M4 Junction 17 are set out in Table 3-3. These schemes will progressively deliver additional capacity at M4 Junction 17 or on the A350, which will subsequently enhance accessibility and journey time reliability to M4 Junction 17. Table 3-3 includes future potential MRN schemes – the need to ensure the overall success of the MRN package has informed identification of Problem 4.

**Table 3-3 - Future transport schemes**

| Scheme   | Description  | Expected opening date / Construction starting                                       |
|--|--|---|
| M4 Junction 17 Improvements – Chippenham Gateway | Capacity increases and signalisation on <b>southern side</b> of junction.  | Construction expected to start by the end of 2021.                                  |
| M4 Junction 17 Improvements - Hullavington       | Capacity increases and signalisation on <b>northern side</b> of junction. Improving capacity and safety.         | Unknown – assumed to be delayed   |
| M4 Junction 17 Future Chippenham Scheme          | Capacity increases and signalisation for the <b>majority of the junction</b> improving both capacity and safety. | Delivery timescales linked to build-out of Future Chippenham.                       |
| A350 Chippenham Phases 4 and 5 MRN               | Bumpers Roundabout and Lackham Roundabout improvements and full dualling between these junctions.                | Construction to begin in 2023 (subject to funding outcome)).                        |
| A350 Melksham Bypass LLM                         | A potential bypass of Melksham, alleviating congestion issues.   | Construction to begin in 2025 (subject to funding outcome and planning permission). |

**Problem 4 - M4 J17 improvements are needed to ensure the overall success of the A350 MRN package.**

### 3.4. Forecast traffic flows and delays

3.4.1.1. Table 3-4 presents average peak hour modelled flows at the junction in 2036 and 2051 compared to 2018 observed data. The flows are based on the Core Scenario comprising committed growth:

- WCS residential and employment growth; and
- Chippenham Gateway.

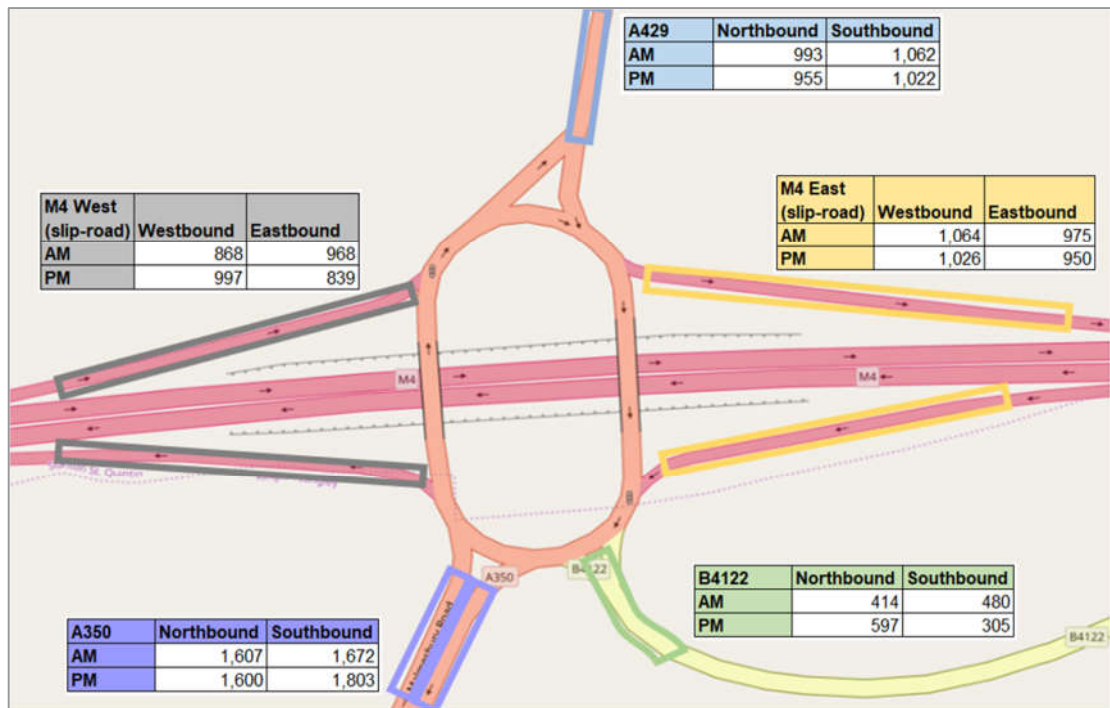
3.4.1.2. Further analysis including the Chippenham Urban Extension will be included in the OBC.

**Table 3-4 - Overall vehicle flows (PCUs) at M4 Junction 17**

| Time period                         | 2018 observed             | 2051 forecast |
|-------------------------------------|---------------------------|---------------|
| AM peak (07:00-10:00, average hour) | 3,942                     | 5,115         |
|                                     | <i>% change from 2018</i> | 30%           |
| PM peak (16:00-19:00, average hour) | 3,726                     | 5,084         |
|                                     | <i>% change from 2018</i> | 36%           |

3.4.1.3. Figure 3-3 displays the forecast traffic flows at each arm of M4 Junction 17 in 2051. With demand from significant planned and future growth the junction is predicted to experience high volumes of traffic, with the majority of traffic approaching/exiting M4 Junction 17 via the A350.

Figure 3-3 - Planned and future growth – average peak hour traffic flow (2051 PCUs)



3.4.1.4. Figure 3-4 and Figure 3-5 show forecast delay at M4 Junction 17 based on committed growth and committed schemes. This shows significant queuing on the A350 approach to M4 Junction 17. This will increase with the inclusion of the Chippenham Urban Extension. The off-slips at M4 Junction 17 would be over capacity – it is likely that without improvements that Highways England would start to object to planning applications and M4 Junction 17 would constrain planned and future housing and employment growth in the Chippenham area and the A350.

Figure 3-4 - V/C Plot (2051 AM Peak)

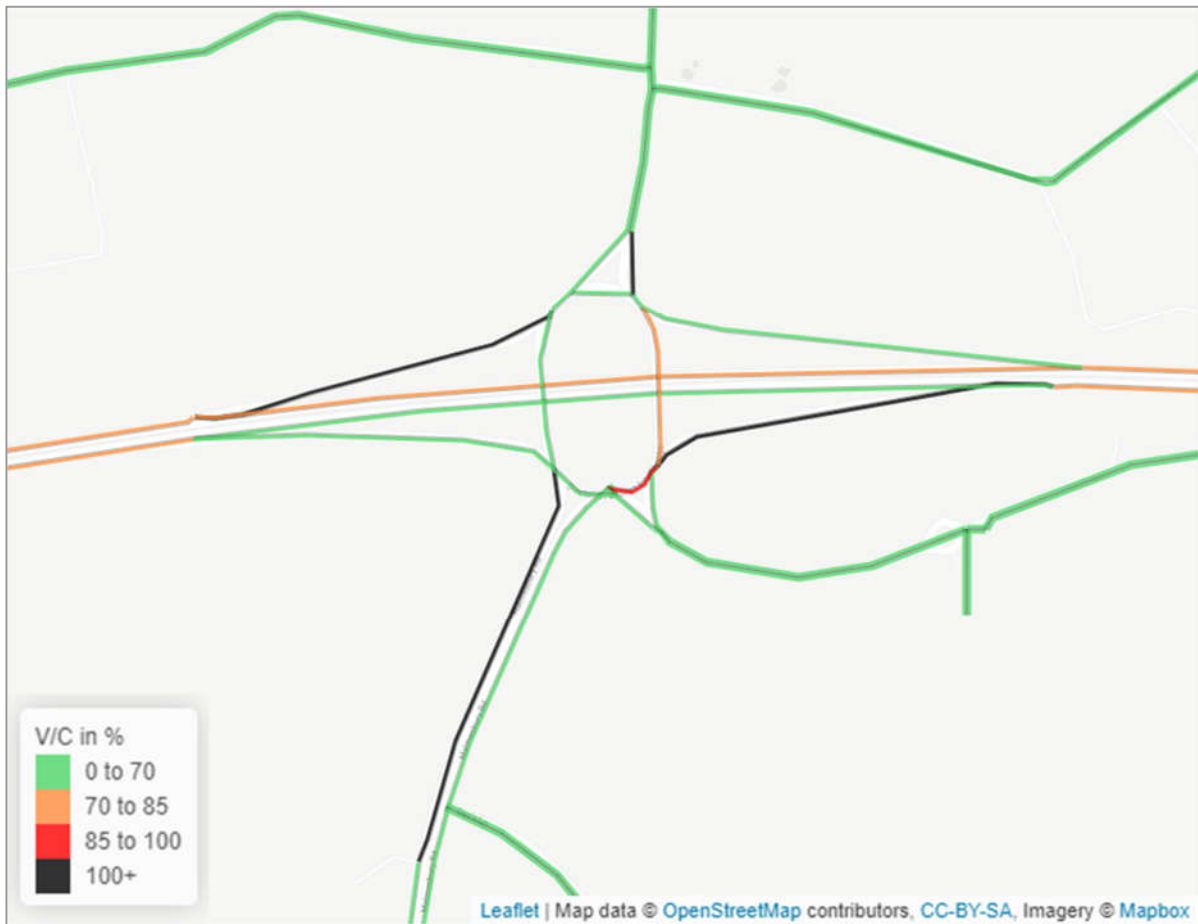
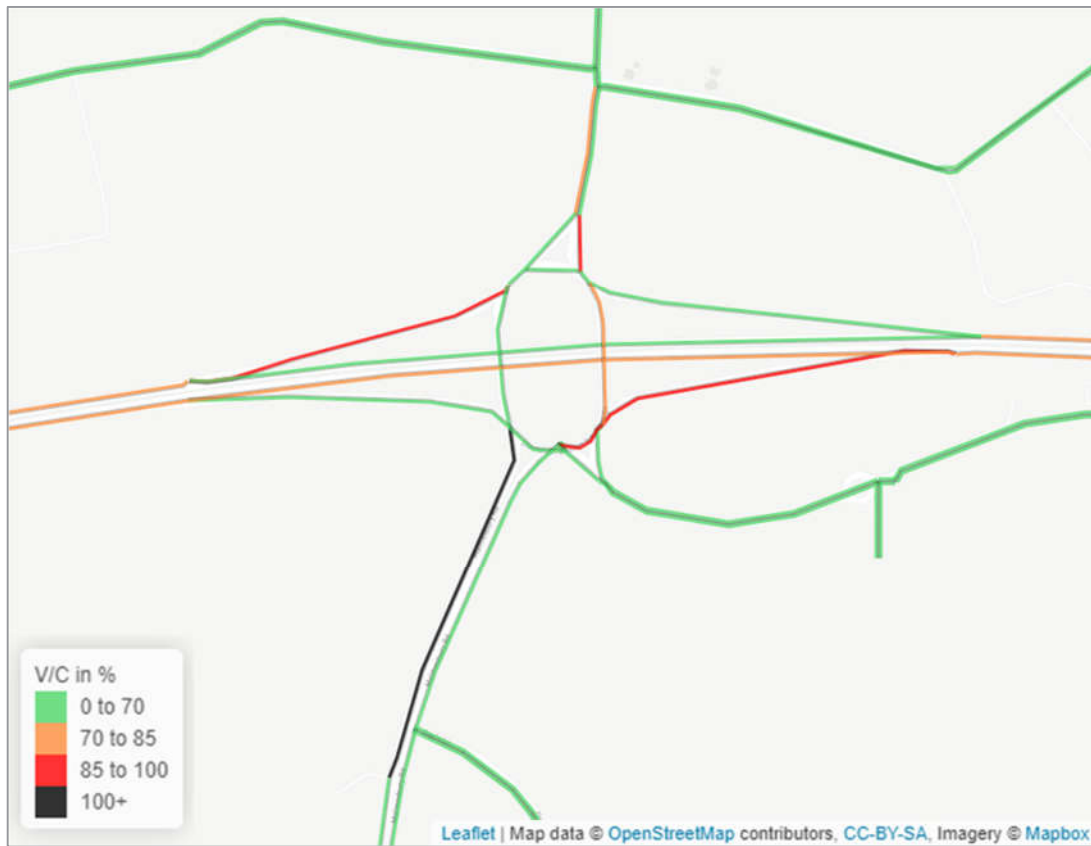


Figure 3-5 - V/C Plot (2051 PM Peak)



- 3.4.1.5. The review of planned developments and associated traffic forecast has further informed identification of Problems 2 and 3:

*Problem 2 - Operational and safety performance of the M4 (SRN) is threatened growth in demand at M4 J17.*

*Problem 3 - Capacity at M4 J17 will constrain planned and future housing and employment growth in the Chippenham area and the A350 Growth Zone.*

### 3.5. Summary

- 3.5.1.1. It is important that that M4 Junction 17 has the capacity to accommodate planned and future growth on the A350 Corridor and in the local SWLEP Growth Zones, including the Chippenham Urban Expansion and the Wiltshire Local Plan Review. This is needed to ensure that forecast traffic growth does not impact on the safe and reliable operation of M4 Junction 17.

- 3.5.1.2. Key future issues are summarised as follows:

*Problem 2 - Operational and safety performance of the M4 (SRN) is threatened growth in demand at M4 J17.*

*Problem 3 - Capacity at M4 J17 will constrain planned and future housing and employment growth in the Chippenham area and the A350 Growth Zone.*

*Problem 4 - M4 J17 improvements are needed to ensure the overall success of the A350 MRN package.*

## 4. Step 3: Establishing the need for intervention

### 4.1. Overview

- 4.1.1.1. This chapter sets out the need for intervention based on the evidence in Chapters 2 and 3 on current and future transport-related problems impacting M4 Junction 17. Figure 4-1 summarises the problems identified.
- 4.1.1.2. Whilst the recently delivered LGF scheme delivered a substantial improvement in junction performance at its major arms, planned and future development detailed in Chapter 3 will contribute to a considerable increase in flows at the junction. Even with the committed Chippenham Gateway mitigation scheme (and Hullavington if it comes forwards) this will place strain on capacity at the junction, creating the rationale for expansion at M4 Junction 17.

**Figure 4-1 - Summary of issues identified – the need for intervention**



### 4.2. Current transport-related problems

- 4.2.1.1. Based on the evidence presented in Chapter 2, the key current transport problems around M4 Junction 17 relate to regional connectivity and safety. Furthermore, issues around operational performance are expected in the short-term (see Section 4.3).
- 4.2.1.2. The need to improve connectivity is a current issue with the need for an effective north-south link between the M4 and the south coast. The need for this strategic route was identified as a priority by the Western Gateway. The purpose of this route is to make it easier to transport freight from the south coast ports and improve road access to London, Wiltshire and the rest of the Western Gateway area, opening up business opportunities. Increasing congestion at M4 Junction 17 and the surrounding A350 corridor will reduce the attractiveness of Wiltshire for inward investment. Furthermore it is important to deliver a single comprehensive solution in this MRN scheme to minimise disruption to strategic traffic.
- 4.2.1.3. The A350 connects west Wiltshire towns, including Chippenham, Melksham, Trowbridge, Westbury and Warminster to the motorway network. Growing congestion and delay at M4 Junction 17 will hinder the economic relationships between the north and south of the area. Problem 1 is therefore both a current and future issue.

**Problem 1 - Strategic role of the A350 (MRN) is threatened by increasing congestion, with potential negative connectivity and economic impacts for West Wiltshire.**

There are a number of collision clusters at M4 Junction 17. Eight collisions have been recorded between May 2018 and December 2019 since the delivery of the LGF scheme, five of which took place at the junction. All five of these accidents were associated with unsignalised arms of the junction.

**Problem 2 - Operational and safety performance of the M4 (SRN) is threatened growth in demand at M4 J17.**

### 4.3. Future transport-related problems

- 4.3.1.1. The inability of the transport network to accommodate the additional demand will hinder delivery of housing and employment growth as well as inward investment. The Chippenham area is a key focus area for growth in Wiltshire, with substantial housing and employment growth planned. The Chippenham Gateway and Hullavington developments are closely linked to the performance and accessibility of M4 Junction 17. Future traffic growth will constrain economic performance.
- 4.3.1.2. Mitigation will be required to ensure that M4 Junction 17 has the capacity to accommodate planned growth (Core Strategy and Chippenham Site Allocations Plan) and future growth ambitions (emerging Local Plan of which the Chippenham Urban Expansion is a part). Highways England has specified that the MRN scheme should be able to cater for the full Local Plan Review growth, including 5,100 homes at Chippenham Urban Expansion up to 2036 (out of the full potential 7,500 homes).
- 4.3.1.3. Flows at M4 Junction 17 will increase as planned and future growth ambitions are realised. Planned growth (Core Strategy and Chippenham Site Allocations Plan) and future growth plans (Chippenham Urban Expansion and emerging Local Plan) will contribute to increased flows at the junction, which will require mitigation.
- 4.3.1.4. Significant future growth planned in the Chippenham area could affect the attractiveness of the area to developers and threaten the function of M4 Junction 17 due to queuing on off-slips. Queues could form on the mainline which threatens the M4's efficiency and poses a safety issue.

**Problem 2 - Operational and safety performance of the M4 (SRN) is threatened by growth in demand at M4 J17.**

**Problem 3 - Capacity at M4 J17 will constrain planned and future housing and employment growth in the Chippenham area and the A350 Growth Zone.**

- 4.3.1.5. The package of A350 MRN improvements is an opportunity to improve north-south connectivity. It is important that M4 Junction 17 supports the package of MRN improvements. Capacity improvements to the A350 are likely to result in a slight increase in levels of traffic using M4 Junction 17 as the intersection between the SRN and MRN. Capacity improvements to the A350 are likely to result in a slight increase in levels of traffic using M4 Junction 17 as the intersection between the SRN and MRN. The increase in capacity on the A350 is likely to attract a proportion of additional traffic due to vehicles re-routing from competitive alternatives. However, route choice in the local highway network is minimal, so a significant increase at M4 Junction 17 is not likely.

**Problem 4 - M4 J17 improvements are needed to ensure the overall success of the A350 MRN package.**

### 4.4. Summary of the need for intervention

- 4.4.1.1. Work undertaken for Steps 1 and 2 of the TAG process for option development has highlighted the existing and forecast problems at M4 Junction 17. Table 4-1 categorises the problems identified into current and future timescales.
- 4.4.1.2. The underlying causes and drivers associated with the problems at M4 Junction 17 include:
- The M4 Junction 17 and the A350 at Chippenham fulfils a local and strategic function (e.g. A350/A429 through traffic and traffic to/from the A350) with high traffic volumes; and

- Housing and employment strategy focused around the A350 corridor, driving increased traffic growth.
- 4.4.1.3. Without further intervention at M4 Junction 17, junction capacity will present a constraint to planned housing and employment growth at the junction as well as in the wider Wiltshire area (including at Chippenham and Malmesbury). The additional traffic would have a detrimental impact on the reliable and efficient movement of traffic between the SRN (M4) and the MRN (A350). The consequences are that the increase in congestion would constrain employment growth, discouraging business expansion and relocation in the area, and as a result, the consequences of the imbalance in homes and jobs will worsen. Further, increased demand at the junction could impact safety performance through an increase in collisions as well as affect user satisfaction. Ultimately, this scenario would be detrimental to economic growth in Wiltshire.

**Table 4-1 - M4 Junction 17 - the need for intervention**

|   | Problem  | Current | Future |
|---|--|---------|--------|
| 1 | Strategic role of the A350 (MRN) is threatened by increasing congestion, with potential negative connectivity and economic impacts for West Wiltshire. | ✓       | ✓      |
| 2 | Operational and safety performance of the M4 (SRN) threatened by growth in demand at M4 Junction 17.   | ✓       | ✓      |
| 3 | Capacity at M4 Junction 17 will constrain planned and future housing and employment growth in the Chippenham area and the A350.                        |         | ✓      |
| 4 | M4 J17 improvements are needed to ensure the overall success of the A350 MRN package.  |         | ✓      |



## 5. Step 4 - Identifying objectives

### 5.1. Overview

5.1.1.1. This chapter sets out the process of identifying the main objectives of the M4 Junction 17 Improvements scheme. The objectives are based on a combination of current issues identified Section 3, future issues identified in Chapter 4, and objectives from relevant existing policy documents outlined in this chapter.

### 5.2. Objectives from key policy documents

5.2.1.1. In formulating the hierarchy of objectives, attention has been paid to ensure that they:

- Address the transport problems identified in Step 3; and
- Relate to the objectives of the key policy documents and studies reviewed in Chapter 2.

5.2.1.2. The strategic objectives relevant to M4 Junction 17 contained in these policy documents are presented in Table 5-1. Several consistent themes are evident across these objectives:

- Supporting economic growth (DfT2, DfT3, SEP2, WCS1), including new housing developments (DfT4, WCS3, LTP12) and town centre regeneration (SEP4, WCS4, LTP1); and
- Improving transport connectivity, reliability and resilience (DfT1, SEP2, WCS6, LTP4, LTP10, LTP18).

**Table 5-1 - Relevant national, regional and local policy and study objectives**

| Document  | Summary of relevant strategic objectives  |
|---|---|
| DfT Transport Investment Strategy               | <ul style="list-style-type: none"> <li>• DfT1: Creating a more reliable, less congested, and better-connected transport network that works for the users who rely on it.</li> <li>• DfT2: Building a stronger, more balanced economy by enhancing productivity and responding to local growth priorities.</li> <li>• DfT3: Enhancing our global competitiveness by making Britain a more attractive place to trade and invest.</li> <li>• DfT4: Supporting the creation of new housing.</li> </ul>                    |
| DfT MRN / Transport Investment Strategy         | <ul style="list-style-type: none"> <li>• Reduce congestion.</li> <li>• Support economic growth and rebalancing.</li> <li>• Support housing delivery.</li> <li>• Support all road users.</li> <li>• Support the SRN.</li> </ul>  |
| Highways England Strategic Business Plan        | <p><b>Key performance indicators</b></p> <ul style="list-style-type: none"> <li>• Making the network safer</li> <li>• Improving user satisfaction</li> <li>• Supporting the smooth flow of traffic</li> <li>• Encouraging economic growth</li> <li>• Achieving real efficiency</li> <li>• Keeping the network in good condition</li> </ul>  |
| Western Gateway STB Emerging Transport Strategy | <ul style="list-style-type: none"> <li>• Improve strategic linkages to drive productivity growth, achieve greater integration between digital and innovation clusters (as identified in the Science and Innovation Audits) and facilitate the creation of new high-value jobs.</li> <li>• Identify and address transport-related barriers to the effective operation of labour markets which is constraining the potential for business growth, particularly in the West of England and South East Dorset.</li> </ul> |

| Document   | Summary of relevant strategic objectives   |
|--|--|
|  | <ul style="list-style-type: none"> <li>• Support the development of low carbon solutions to strategic connectivity to help reduce transport's impact on the local environment.</li> <li>• Establish a whole corridor approach to traffic management on strategic corridors to improve reliability, safety and resilience.</li> <li>• Address the poor connectivity of north-south links, particularly to and from the south coast ports, to help support planned development, drive business growth and improve access to international markets.</li> <li>• Deliver key transport infrastructure that supports sustainable place-shaping by facilitating the delivery of significant land for new homes and employment opportunities.</li> </ul>   |
| <p>Swindon and Wiltshire Strategic Economic Plan</p> | <ul style="list-style-type: none"> <li>• SEP2: Transport infrastructure improvements - we need a well-connected, reliable and resilient transport system to support economic and planned development growth at key locations.</li> <li>• SEP4: Place shaping - we need to deliver the infrastructure required to deliver our planned growth and regenerate our City and town centres, and improve our visitor and cultural offer.</li> </ul>   |
| <p>Wiltshire Core Strategy (WCS)</p>                 | <ul style="list-style-type: none"> <li>• WCS1: Delivering a thriving economy.</li> <li>• WCS3: Providing everyone with access to a decent, affordable home.</li> <li>• WCS4: Helping to build resilient communities.</li> <li>• WCS6: Ensuring that adequate infrastructure is in place to support our communities.</li> </ul>   |
| <p>Chippenham Site Allocations Plan (CSAP)</p>       | <ul style="list-style-type: none"> <li>• Chippenham will have an integrated approach to transport so that traffic flow will be more efficient, the town centre will be less congested and there will be improved access for sustainable modes of transport.</li> <li>• Chippenham will take advantage of its excellent rail and road links and its position on the high-tech corridor between London, Bristol and beyond. It will strengthen its offer and role as a business location ensuring people can live and work locally.</li> </ul>   |
| <p>Wiltshire Local Transport Plan (LTP)</p>          | <p><b>Goal: Support Economic Growth</b></p> <ul style="list-style-type: none"> <li>• LTP1: Support and help improve the vitality, viability and resilience of Wiltshire's economy and market towns.</li> <li>• LTP4: Minimise traffic delays and disruption and improve journey time reliability on key routes.</li> <li>• LTP10: Encourage the efficient and sustainable distribution of freight in Wiltshire.</li> <li>• LTP12: Support planned growth in Wiltshire and ensure that new developments adequately provide for their sustainable transport requirements and mitigate their traffic impacts.</li> </ul> <p><b>Goal: Reduce Carbon Emissions</b></p> <ul style="list-style-type: none"> <li>• LTP11: Reduce the level of air pollutant and climate change emissions from transport.</li> </ul> <p><b>Goal: Contribute to Better Safety, Security and Health</b></p> <ul style="list-style-type: none"> <li>• LTP8: Improve safety for all road users and reduce the number of casualties on Wiltshire's roads.</li> </ul> <p><b>Goal: Promote Equality of Opportunity</b></p> <ul style="list-style-type: none"> <li>• LTP5: Improve sustainable access to a full range of opportunities particularly for those people without access to a car.</li> <li>• Goal: Improve Quality of Life and a Healthy Natural Environment</li> </ul> |

| Document | Summary of relevant strategic objectives  |
|----------|---|
|          | <ul style="list-style-type: none"><li data-bbox="462 220 1421 283">• LTP3: Reduce the impact of traffic on people's quality of life and Wiltshire's built and natural environment.</li><li data-bbox="462 283 1421 325">• LTP18: Enhance the journey experience of transport users.</li></ul> |

### 5.3. Strategic outcomes

- 5.3.1.1. The strategic outcomes for this scheme seek to address the negative outcomes resulting from the identified problems (Table 4-1) and assist in delivering the strategic objectives contained in overarching policy documents (Table 5-1). The strategic outcomes are:
- Sustainable economic growth in the A350 Corridor and A350 and Swindon M4 SWLEP Growth Zones with positive impact on regional and national economic productivity;
  - Facilitate planned (Core Strategy and CSAP) and future (Chippenham Urban Expansion and emerging Local Plan Review) housing and employment growth through increasing capacity of the transport network;
  - Preserve the strategic function of the A350 corridor for Wiltshire; and,
  - Improve connectivity between the MRN and SRN.

### 5.4. Transport objectives

- 5.4.1.1. Five linked local transport objectives have been proposed in Table 5-2, which draw on the themes identified from existing policy documents and aim to address the transport problems identified in Chapters 3 and 4. This informs operational objectives and indicators of success.
- 5.4.1.2. For the indicators of success, TAG requires the transport objectives to be SMART, i.e. Specific, Measurable, Agreed upon, Realistic and Time-bound. For each of the objectives, measures for success have been devised which will enable options to be appraised and provide the basis for monitoring and evaluation of the scheme.

**Table 5-2 - Scheme objectives**

| Overarching objectives                  | Local transport objectives   | Operational outcomes  | Problems addressed | Indicative indicators of success   |
|---|--|---|--------------------|--|
| Reduce congestion<br>Support the SRN    | Reduce delay and improve journey time reliability at M4 Junction 17, supporting journeys on the SRN.   | Maintain reliable access to/from the M4 for businesses in Chippenham and for residents of the A350 towns including Chippenham and Melksham.   | 1, 2               | Reduction in junction delay at M4 Junction 17 compared to a Do-Minimum scenario. <sup>18</sup><br><i>Target to be set in the OBC.</i>  |
|   | Support the overall success of the A350 improvements programme (including MRN) by delivering complementary improvements at M4 Junction 17.   |   |                    |  |
| Support economic growth and rebalancing | Improve north-south connectivity on the A350 through improvements to M4 Junction 17, the gateway to the A350 from the SRN.   | Improve connectivity and journey times on the A350 between the M4 at Junction 17 and Chippenham.  | 1, 4               |  |
| Support housing delivery                | Ensure that M4 Junction 17 has the capacity to accommodate planned and future growth in the A350 Corridor and in the A350 and Swindon M4 SWLEP Growth Zones, including the Chippenham Urban Expansion and the Wiltshire Local Plan Review. | Ensure M4 Junction 17 operates within its capacity following the delivery of planned growth (Core Strategy and CSAP) and future growth (Chippenham Urban Expansion and emerging Local Plan Review). | 3                  | Facilitate the phased delivery of housing and employment through the Local Plan Review. Contribute to securing of the Future Chippenham planning permission linked to this scheme.<br><i>Target to be set in the OBC.</i><br>Volume/capacity at M4 Junction 17 does not exceed 90% in 2036 for the junction as a whole.<br>Volume/capacity at M4 Junction 17 does not exceed 90% in 2036 for motorway off-slips. |
| Support all road users                  | Increase safety levels at M4 Junction 17, taking into account forecast traffic growth.   | No increase in collisions at M4 Junction 17.  | 2                  | Reduction in collisions at M4 junction 17, 5 years after scheme opening.<br><i>Target to be set in the OBC.</i>  |

<sup>18</sup> This will be achieved through comparison of the 'S' model against the 'P' model. Please refer to the ASR for details of what is included in these transport model scenarios.

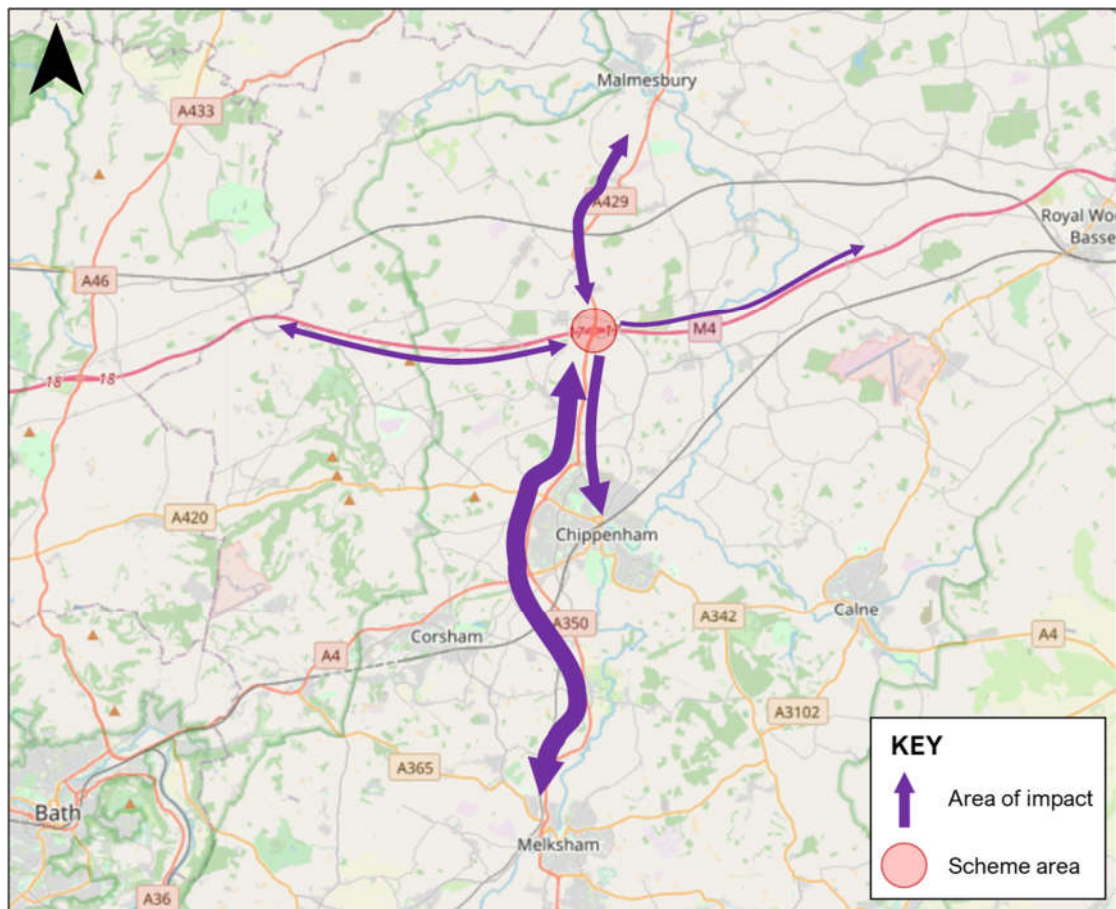
## 5.5. Define geographic area of impact

5.5.1.1. Given the problems identified in Table 4-1, and the objectives identified in Step 4a, any interventions should aim to have a beneficial impact on both the M4 Junction 17 as a whole and the wider A350 corridor, as shown in Figure 5-1. This is based on an indicative model test of an improvement to M4 Junction 17.

5.5.1.2. Specifically, the geographic area of impact should encompass the following areas:

- A350 corridor between Malmesbury and Melksham;
- Planned development sites at Chippenham Gateway, Hullavington and Chippenham Gateway; and
- Principal employment areas in Chippenham, including the Bumpers Farm Industrial Estate and Methuen Park.

Figure 5-1 - M4 Junction 17 area of impact



## 6. Initial option assessment (Steps 5-6)

### 6.1. Step 5: Generating options

The purpose of option generation is to develop a range of transport measures or interventions that could achieve the objectives set out in Chapter 5.

- 6.1.1.1. The search for potential solutions covers different types of intervention and modes. Potential interventions derive from two broad strategic themes; mode shift and highway capacity enhancement. The former seeks to reduce travel demand at M4 Junction 17, while the latter approach increases the capacity of the transport network at M4 Junction 17.
- 6.1.1.2. An options long-list was generated under the two strategic themes to ensure a fair representation of interventions. The full list of options is described in Table 6-1.

**Table 6-1 - Option long-list**

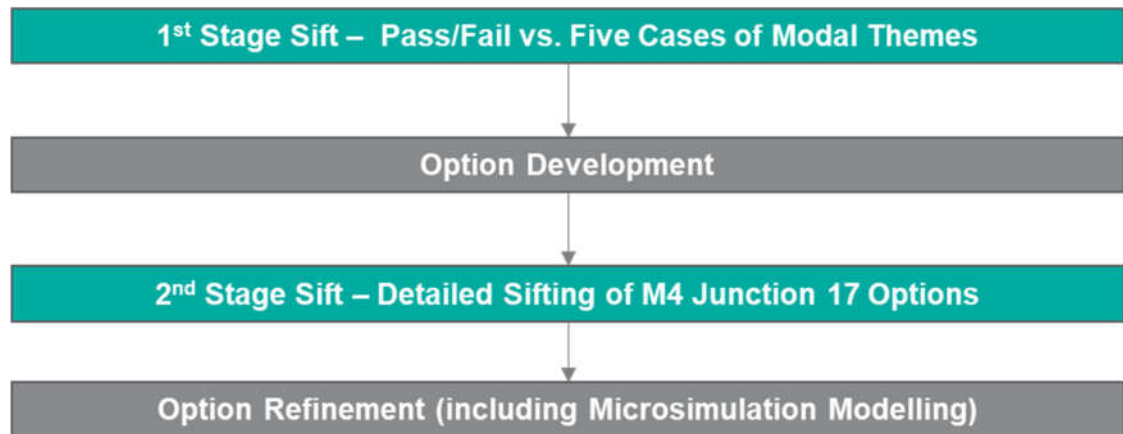
| Strategic Theme                            | Modal Theme         | Strategic option                           | Comments   |
|--|---------------------|--|--|
| Reducing highway demand through mode shift | Rail                | Rail service / infrastructure improvements | Enhancing rail services and access to Chippenham rail station will deliver enhanced options for long-distance commuters and journeys to West Wiltshire.  |
|  | Bus                 | Bus service / infrastructure improvements  | Enhancing bus services in the towns surrounding M4 Junction 17 (including Chippenham and Malmesbury) would aim to make bus services more attractive for local journeys and journeys along the A350 corridor. |
|  | Walking/<br>Cycling | Improved walking / cycling routes          | New cycle and pedestrian routes could allow these modes to travel more freely in the towns surrounding M4 Junction 17, particularly when accessing/crossing or traveling along the A350.                     |
| Highway capacity improvement               | Highway             | Improvements to M4 Junction 17             | Improvements to M4 Junction 17 including signalisation and improvements to the circulatory and/or slip roads, to increase capacity at the junction.  |

### 6.2. Step 6: Initial Sifting

#### 6.2.1. Overview

- 6.2.1.1. The two stage options assessment process which was undertaken is summarised in Figure 6-1. The first stage was a high-level sift of the four modes in Table 6-1 (bus, rail, cycling and highway). This was followed by further option development and the detailed second stage sifting of the developed options. The final stage of the process was option refinement informed by microsimulation modelling.

Figure 6-1 - Sifting overview



### 6.2.2. 1<sup>st</sup> Stage Sift

6.2.2.1. Pass/fail criteria were used to identify 'showstopper issues' for the 1<sup>st</sup> stage sift of modal themes. Criteria were based around the DfT's five cases model<sup>19</sup>. Pass/fail was used because summing or averaging the assessment scores could mask critical issues. One 'fail' on any one of the five cases resulted in the option being discarded.

Figure 6-2 - Fail criteria for option sifting

|   |  |
|---|--|
| <b>Strategic Case</b>                   | <ul style="list-style-type: none"><li>Option will not make a moderate or significant contribution for any of the scheme objectives.</li></ul>  |
| <b>Economic Case</b>                    | <ul style="list-style-type: none"><li>Option offers poor value for money.</li></ul>  |
| <b>Management Case</b>                  | <ul style="list-style-type: none"><li>Major deliverability risks (in relation to practicality or timescales) are presented, or there are likely to be considerable and insurmountable public acceptability issues.</li></ul> |
| <b>Financial &amp; Commercial Cases</b> | <ul style="list-style-type: none"><li>Option is unaffordable in terms of the capital investment required or ongoing revenue liabilities.</li><li>Option has limited or no possibility for funding.</li></ul>                 |

### 6.2.3. Strategic and Economic Case

6.2.3.1. The Strategic Case sifting is based on fit against the scheme objectives. Table 6-2 compares the options against the objectives using a five-point scale – two ticks means that the scheme fully addresses the specific objective without any undesirable consequences.

<sup>19</sup> *The Transport Business Cases*, Department for Transport, January 2013.

6.2.3.2. The scheme objectives comprise:

- **Objective 1:** Reduce delay and improve journey time reliability at M4 Junction 17, supporting journeys on the SRN;
- **Objective 2:** Support the overall success of the A350 improvements programme (including MRN) by delivering complementary improvements at M4 Junction 17;
- **Objective 3:** Improve north-south connectivity on the A350 at M4 Junction 17, the gateway to the A350 from the SRN;
- **Objective 4:** Ensure that M4 Junction 17 has the capacity to accommodate planned and future growth in the A350 Corridor and A350 and Swindon M4 SWLEP Growth Zones, including the Chippenham Urban Expansion and the Wiltshire Local Plan Review; and
- **Objective 5:** Increase safety levels at M4 Junction 17 taking into account forecast traffic growth.

6.2.3.3. Table 6-2 shows that the modal option of a highway improvement to M4 Junction 17 has the strongest fit against the scheme objectives.

**Table 6-2 – Strategic Case - scoring of individual options against objectives**

| Modal option                               | Objective 1 | Objective 2 | Objective 3 | Objective 4 | Objective 5 |
|--|-------------|-------------|-------------|-------------|-------------|
| Rail service / infrastructure improvements | ✓✓          | –           | ✓           | ✓✓          | –           |
| Bus service / infrastructure improvements  | ✓           | ✓           | ✓           | –           | –           |
| Improved walking / cycling routes          | –           | –           | –           | –           | –           |
| Highway improvement to M4 Junction 17      | ✓✓✓         | ✓✓✓         | ✓✓✓         | ✓✓✓         | ✓✓          |

- ✓✓✓ Significant positive contribution to objective.
- ✓✓ Moderate positive contribution to objective.
- ✓ Minor positive contribution to objective.
- No impact on scheme objective.
- × Minor negative contribution to objective.
- ×× Moderate negative contribution to objective.
- ××× Significant negative contribution to objective.

6.2.3.4. The Economic Case sifting is a qualitative assessment on value for money. If an option is likely to deliver poor or very poor value for money it is sifted out.

6.2.3.5. Table 6-3 summarises the rationale for passing or failing options based on the Strategic and Economic Cases.



**Table 6-3 - 1<sup>st</sup> stage sift – Strategic and Economic Case summary**

| Option | Description                                | Strategic Case Pass/Fail | Economic Case Pass/Fail | Reasons for pass or fail   |
|--------|--|--------------------------|-------------------------|--|
| 1      | Rail service / infrastructure improvements | Fail                     | Pass                    | Whilst it is recognised that this option would be beneficial to the local area by making rail more attractive to Chippenham residents and employees, it would not cater for the wide range of journeys passing through M4 Junction 17 to make a material difference to traffic demand at this junction. Nevertheless, rail continues to have an important role to the A350 and West Wiltshire.                         |
| 2      | Bus service / infrastructure improvements  | Fail                     | Fail                    | Whilst the proposed option would be beneficial to the local area by making bus travel more attractive to Chippenham residents and employees, taking into account current service provision profiles it would not cater for the longer distance journeys through M4 Junction 17. Viability would affect the Economic Case. Nevertheless, bus travel continues to have an important role to the A350 and West Wiltshire. |
| 3      | Improved walking / cycling routes          | Fail                     | Fail                    | Whilst the proposed option would be beneficial to the local area by making walking and cycling more attractive to Chippenham residents and employees, it would not cater for the longer distance journeys through M4 Junction 17. Nevertheless, walking and cycling continues to have an important role to the A350 and West Wiltshire.  |
| 4      | Highway improvement to M4 Junction 17      | Pass                     | Pass                    | Strong fit with scheme objectives.   |

#### 6.2.4. Management, Financial and Commercial Cases

- 6.2.4.1. The Management, Financial and Commercial Cases sifting comprises a qualitative assessment of critical issues affecting deliverability and viability. For example, the MRN fund is a capital pot only and does not include revenue funding for public transport services.
- 6.2.4.2. Table 6-4 summarises the rationale for passing or failing options based on the Strategic and Economic Cases.

**Table 6-4 - 1<sup>st</sup> stage sift – Management, Financial and Commercial Cases summary**

| Option | Description                                | Financial / Commercial Case | Management Case | Reasons for pass or fail  |
|--------|--|-----------------------------|-----------------|---|
| 1      | Rail service / infrastructure improvements | Fail                        | Fail            | <ul style="list-style-type: none"> <li>Rail service improvements are revenue funded – MRN fund is capital only. If revenue funding opportunities became available then rail service improvements would complement the A350 programme.</li> <li>Long delivery timescales to secure improvements to long-distance rail services.</li> </ul> |
| 2      | Bus service / infrastructure improvements  | Fail                        | Pass            | <ul style="list-style-type: none"> <li>Bus service improvements are revenue funded – MRN fund is capital only. If revenue funding opportunities became available then bus service improvements would complement the A350 programme.</li> </ul>  |
| 3      | Improved walking / cycling routes          | Fail                        | Pass            | <ul style="list-style-type: none"> <li>MRN fund is not for solely walking/cycling schemes although improvements can be integrated into an MRN scheme.</li> </ul>  |
| 4      | Highway improvement to M4 Junction 17      | Pass                        | Pass            | <ul style="list-style-type: none"> <li>Scheme is broadly affordable in the context of the MRN and considered to be deliverable.</li> </ul>  |

### 6.2.5. Summary of 1<sup>st</sup> Stage Sift

6.2.5.1. The initial sifting exercise is presented in Table 6-5, with further explanation behind the sifting results given in . As a result of the sifting exercise, the highway theme proceeded to Step 7 of the TAG process for option development.

6.2.5.2. The sifting takes into account the scope of the MRN fund. Note that opportunities to support public transport and active modes would be considered in any shortlisted options if appropriate. A Walking, Cycling and Horse Riding survey will be carried out to identify any opportunities which could be incorporated into the scheme at preliminary design.

**Table 6-5 - Option sifting**

| Modal option                               | Strategic | Economic | Financial / Commercial Case | Management Case | Overall assessment |
|--|-----------|----------|-----------------------------|-----------------|--------------------|
| Rail service / infrastructure improvements | Fail      | Pass     | Fail                        | Fail            | Fail               |
| Bus service / infrastructure improvements  | Fail      | Fail     | Fail                        | Pass            | Fail               |
| Improved walking / cycling routes          | Fail      | Fail     | Fail                        | Pass            | Fail               |
| Highway improvement to M4 Junction 17      | Pass      | Pass     | Pass                        | Pass            | Pass               |

## 7. Further assessment (Steps 7-8)

### 7.1. Step 7 (Part 1): Development and assessment of potential options

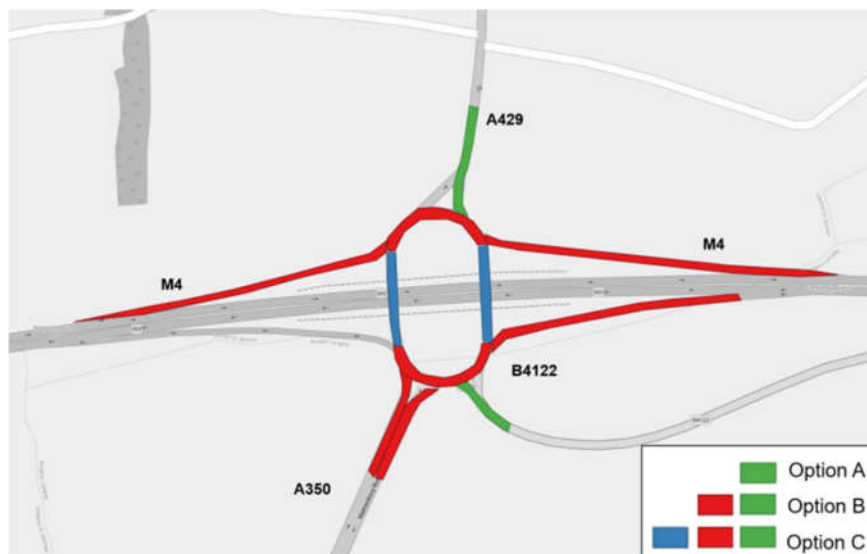
7.1.1.1. The development of scheme options has taken place over a number of years and has been informed by a range of technical studies starting in 2019. In 2019 Atkins produced an OAR which formed the basis of an SOBC. This was updated in this OAR Refresh in 2021 which will inform the OBC. Since the SOBC was submitted LINSIG was used to refine the options (2 vs. 3 lanes on the circulatory), and further VISSIM testing will be carried out to support OBC scheme design.

#### 7.1.2. Development of potential options

7.1.2.1. Three potential options were developed under the highway modal theme (see Figure 7-1):

- Option A - Widen the A429 and B4122 approaches to M4 Junction 17 and delivering full signalisation;
- Option B - Widen all approaches to M4 Junction 17 and M4 slip roads, and deliver full signalisation (remains 2 lanes on the gyratory); and
- Option C - Widen overbridges at M4 Junction 17 and deliver an upgrade to 3 lanes on the gyratory. Widen approaches to M4 Junction 17 and deliver full signalisation.

Figure 7-1 – M4 Junction 17 highway options



7.1.2.2. Option A has been omitted from the updated sifting because it comprises the mitigation for Chippenham Gateway and Hullavington only, without providing for further capacity enhancements. Option A did not perform strongly in the SOBC assessment and does not meet the full scheme objectives of catering for Local Plan Review growth and providing a single, comprehensive solution at M4 Junction 17 – this is a particularly important criteria for National Highways in order to prevent multiple, progressive upgrades to the junction which would result in far greater user disruption.

#### 7.1.3. Assessment of potential options – 2<sup>nd</sup> stage sift

7.1.3.1. In line with the guidance in TAG Unit 2.1.2d, a proportionate sifting approach has been adopted. The intention is that the strongest option is carried forward to option refinement and progress to OBC stage.

7.1.3.2. Wiltshire Council is seeking to work collaboratively with Highways England to agree on a preferred Option for M4 Junction 17. There is agreement on the need for intervention to cater for significant growth in the Chippenham area. To support the scheme development, Highways England has funded development of a base and Do Minimum forecast model for M4 Junction 17 which has been

used by Atkins for option refinement. A series of meetings have been held with Highways England to discuss option development.

#### The method

- 7.1.3.3. The scoring method allows scores to be calculated and weightings applied for each of the five cases (weightings are shown on the flowchart). The scoring method flowchart is included in Appendix A. The same weightings applied in the LTB major scheme prioritisation have been used for this option assessment process, to reflect the different levels of importance that have already been attributed by the LTB to the five cases.
- 7.1.3.4. The sifting is largely qualitative. Quantitative data has been used where available, for example previous LinSig testing. This was taken into account in the Strategic and Economic Case scoring, in terms of the scale of problem scheme is designed to address and likely Value for Money.
- 7.1.3.5. The total score for each option is between 0 and 60. The purpose of the total score is to enable comparison of the relative, rather than absolute, performance of the options where the most favourable option is the one which scores the highest regardless of the size of the score.

#### Strategic Case

- 7.1.3.6. Options B and C perform strongly against the strategic case. Option C scores higher because it would support higher levels of growth with three lanes on the gyratory compared to two lanes under Option B.
- 7.1.3.7. LinSig modelling was conducted to assess the performance of different scheme options at M4 Junction 17 under different demand scenarios. The modelling assessed the difference between options with 2-lanes and 3-lanes on the overbridges on the circulatory. The demand scenarios tested include 2036 Core (including core growth only), 2036 High (including core growth with demand from Chippenham Urban Expansion and Hullavington developments) and 2051 Core (with core growth only).
- 7.1.3.8. As demonstrated in Table 7-1, with a 2-lane circulatory M4 Junction 17 exceeds practical reserve capacity in the PM peak in 2036 under high-growth demand conditions, resulting in high levels of delay. In comparison a 3-lane circulatory continues to operate efficiently in both the AM and PM peak periods in both core-growth and high-growth demand scenarios.
- 7.1.3.9. In 2051 with 2-lane circulatory the M4 Junction 17 experiences considerable increases in delay as a result of significantly exceeding capacity at the junction. Despite marginally exceeding junction capacity, a 3-lane circulatory reduces the amount of delay at the junction as a result of long-term demand increases.

**Table 7-1 – LinSig junction modelling results**

| Forecast Year | Time Period | Scenario | 2-Lane Circulatory             |                | 3-Lane Circulatory             |                |
|---------------|-------------|----------|--------------------------------|----------------|--------------------------------|----------------|
|               |             |          | Practical Reserve Capacity (%) | Delay (pcu/hr) | Practical Reserve Capacity (%) | Delay (pcu/hr) |
| 2036          | AM          | Core     | 7.2                            | 60.65          | 30.2                           | 52.30          |
|               |             | High     | -1.1                           | 79.75          | 5.1                            | 56.52          |
|               | PM          | Core     | 4.2                            | 72.31          | 25.5                           | 70.08          |
|               |             | High     | 2.1                            | 88.60          | 11.4                           | 73.85          |
| 2051          | AM          | Core     | -46.4                          | 287.81         | -3.4                           | 95.96          |
|               | PM          | Core     | -19.0                          | 204.40         | -6.3                           | 119.44         |

- 7.1.3.10. In summary, the introduction of the 3<sup>rd</sup> lane on both circulatory overbridges provides the required capacity for efficient junction operation for 2036 high-growth forecast in both AM and PM peak hours. The 3<sup>rd</sup> lane provides additional capacity providing efficient junction operation in the long term, beyond the Local Plan period and covering the majority of the traffic growth forecast up to 2051.

#### Economic Case

- 7.1.3.11. Option C scores lower than Option B on potential Value for Money – Option C involves significant structural works to M4 Junction 17 to deliver three lanes on the gyratory. This would result in substantially higher costs without a commensurate rise in benefits.
- 7.1.3.12. Option C has a greater impact on the environment than Option B. Direct impact on hedges and trees within the verge for a widened highway bridge corridor and the geology within the GSSSI could be expected as part of this work. Additional materials and waste and climate impact would also be expected as part of the construction works to widen both over bridges.

#### Commercial Case

- 7.1.3.13. Option C scores significantly lower than Option B due to the higher complexity of delivering structural alterations to a motorway junction.

#### Financial Case

- 7.1.3.14. Option C scores lower than Option B due to its higher cost. Approximately £4.4m has been identified from Future Chippenham, this would be sufficient as a 15% local contribution for Option B at approximately £25m but would be insufficient for Option C at of approximately £50m. Also, Option C would have higher maintenance costs due to introducing new structures.

#### Management Case

- 7.1.3.15. Option C scores lower due to having a higher scheme development risk due to the higher complexity of this option. Works on or near the GSSSI at M4 Junction 17 will require assent from Natural England; whilst this should be applied for with both options, it is expected that Option C will have a direct impact on the SSSI resulting in a risk to deliverability and a high likelihood of extension to scheme programme.
- 7.1.3.16. Works to widen the overbridges for Option C will impact on hedges and trees within the verge alongside the M4. Appropriate environmental mitigation would be progressed, however Option C has a greater risk to programme extension than Option B.
- 7.1.3.17. Construction works for widening of both overbridges will require a significant extension to the scheme construction programme, including direct impact upon mainline M4 traffic. Disruption during the construction of the scheme is far greater for Option C than Option B.

#### Summary

- 7.1.3.18. Table 7-2 presents the findings from the 2<sup>nd</sup> stage sift.

**Table 7-2 – Summary of further assessment scoring**

| Option  | Weighted Score<br>(max. = 60) | Unweighted scores by case ( <i>maximum = 60</i> ) |          |            |           |            |
|---|-------------------------------|---|----------|------------|-----------|------------|
|   |                               | Strategic   | Economic | Commercial | Financial | Management |
| <b>Option B:</b> Widen all approaches and M4 slips to M4 Junction with full signalisation (2 lanes circulatory)                   | <b>42.6</b>                   | 56.7  | 32.5     | 30.0       | 54.0      | 40.0       |
| <b>Option C:</b> Widen overbridges. Widen approaches and M4 slips to M4 Junction 17 with full signalisation (3 lanes circulatory) | <b>25.4</b>                   | 60.0  | 28.8     | 0.0        | 18.0      | 20.0       |

- 7.1.3.19. A breakdown of the individual scores attributed is included in Appendix A.

## 7.2. Step 7 (Part 2): Option refinement

### 7.2.1. Option refinement – sifting

7.2.1.1. The sifting summarised in Table 7-2 shows that Option C is the strongest option in terms of the Strategic Case. This is due to having three lanes on the gyratory which would support a higher level of growth than Option B. However, Option C is limited by cost which would affect Value for Money, affordability and add complexity to the scheme’s delivery. Following engagement with National Highways, a hybrid option, ‘Option B+’, has been developed, which is a blend of Options B and C:

**Option B+ (and design refinements thereof):** Widen approaches to M4 Junction 17 and deliver full signalisation as well as an additional lane on the entirety of the gyratory (3 narrow lanes to remove requirement to widen the overbridges).

7.2.1.2. Table 7-3 shows the performance of Option B+ under the same scoring criteria – the key differences to Options B and C comprise:

- Strategic Case: Option B+ has the same Strategic Case score as Option C because it address a similar scale of problem;
- Economic Case – Option B+ has a slightly lower score than Option B and slightly higher than Option C:
  - For Option B+ there may be potential safety implications of running three narrow lanes on the circulatory (subject to further investigation, but at this stage a slight adverse score is applied for the Social criteria).
  - Option B+ would have a higher Value for Money than Option C – Option B+ would enable capacity increases on the overbridges, without the cost of overbridge widening.

7.2.1.3. The three narrow lanes across the overbridges parallel HGV movements. A review of vehicle swept paths for all movements entering and exiting the junction will be progressed. The junction modelling will be coded to present results that consider the swept path constraints. Safety implications of 3 narrow lanes will be reviewed as part of the road safety audit and is reflected in the scoring in Table 7-3.

**Table 7-3 – Further assessment, option refinement (Option B+) scoring**

| Option  | Weighted Score<br>( <i>max.</i> = 60) | Unweighted scores by case ( <i>maximum</i> = 60) |          |            |           |            |
|---|---------------------------------------|--|----------|------------|-----------|------------|
|   |                                       | Strategic  | Economic | Commercial | Financial | Management |
| <b>Option B+</b> Widen all approaches and M4 slips to M4 Junction with full signalisation (3 lanes circulatory without overbridge widening) | <b>42.8</b>                           | 60.0   | 30.0     | 30.0       | 54.0      | 40.0       |

7.2.1.4. Overall, Option B+ is expected to achieve similar transport outcomes to Option C, but Option C has a significantly higher cost (associated with the overbridges structural works), and would therefore deliver lower VfM. It also has more significant deliverability challenges. Option B has a similar cost to Option B+, but it provides less capacity and therefore is not expected to perform as well as Option B+ in the medium to longer term; a concern expressed by National Highways. It would have similar impacts to Option B+ in other regards (e.g. environmental and social impacts), but would overall deliver lower VfM

## 7.2.2. Further option refinement – microsimulation testing of Option B+

- 7.2.2.1. Following the sifting, further testing of Option B+ was carried out using a VISSIM microsimulation model, in conjunction with National Highways<sup>20</sup>. The Option B scenario was taken and incrementally tested within the VISSIM model to determine the optimal design for Option B+. Full technical details of this stage are documented in a separate report, issued to National Highways<sup>21</sup>.
- 7.2.2.2. The optimised design reflects the Option B+ concept and incorporates the following modifications:
- 3 lanes on M4 westbound off-slip approach to Junction 17;
  - Approximately a 135m flare from two lanes to the stopline on the M4 Westbound off-slip;
  - Two lanes allowed to make the movement from the A350 northbound to M4 westbound on-slip;
  - Approximately a 180m length of two lane section on the A429 southbound to the stopline;
  - Approximately a 130m section of three lanes on the A429 southbound approach; and
  - Modifications to the merge/diverges as required.
- 7.2.2.3. The Wiltshire Transport Model (WTM) has been used to provide traffic forecasting for the operational assessment. The 2036 forecast model has been developed following a process of agreeing scenario with HE, and includes the following:
- 2036 Local Plan Review + full Chippenham Urban Extension: the ‘Local Plan Review’ scenario, plus a further 2,400 dwellings associated with the Chippenham Urban Extension, thereby totalling 7,500 dwellings as per the approved Housing Infrastructure Fund submission for infrastructure funding.
- 7.2.2.4. The demands used within the model were developed from the WTM peak hour SATURN forecasts, with the WTM cordoned around the M4 Junction 18, providing a five-zone matrix to align with the VISSIM coding. The peak hour demands were converted into full VISSIM demands using the base VISSIM shoulder proportions, which were then applied to the peak hour matrix. The growth in the SATURN model, as mapped and profiled to the VISSIM system, has been added to the VISSIM base demands using the following formula:
- $VISSIM\ Forecast = 2018\ VISSIM\ Survey + (SATURN\ Forecast - SATURN\ Base)$
- 7.2.2.5. Operational assessment has been undertaken by comparing the Option B+ VISSIM scenario, against a Do Minimum scenario<sup>22</sup>. The maximum queue results are shown in Table 7-4.

**Table 7-4 - Maximum Queue Results- M4 Junction 17 B+**

| Location         | Available Queue (m) | Do Minimum |           | B+        |           | Difference |           |
|------------------|---------------------|------------|-----------|-----------|-----------|------------|-----------|
|                  |                     | 0800-0900  | 1700-1800 | 0800-0900 | 1700-1800 | 0800-0900  | 1700-1800 |
| M4 West Off-slip | 370                 | 138        | 111       | 172       | 118       | 34         | 8         |
| A429 North       | 240                 | 1,760      | 1,758     | 874       | 285       | -886       | -1,473    |
| M4 East Off-slip | 400                 | 1,506      | 276       | 84        | 92        | -1,421     | -184      |
| B4122            | 630                 | 911        | 909       | 140       | 127       | -771       | -782      |
| A350 South       | 400                 | 1,934      | 1,937     | 886       | 183       | -1,049     | -1,754    |

- 7.2.2.6. The results show that there are predicted to be substantial queueing benefits with Option B+ when compared against the Do Minimum, in both the morning and evening peak. The queueing on the M4 East off-slip suggests that in the Do Minimum the vehicles on the slip road would queue back and interact with the M4 mainline. In the B+ scenario, this queue is predicted to be reduced to within the available queueing space on the slip road. There are predicted to be two arms in the morning peak where the maximum queue extends beyond the available queueing space in the B+ scenario: the

<sup>20</sup> The M4 Junction 17 VISSIM model was originally developed by Jacobs on behalf of National Highways.

<sup>21</sup> M4 Junction 17 VISSIM Operational Assessment Report (Atkins, September 2021)

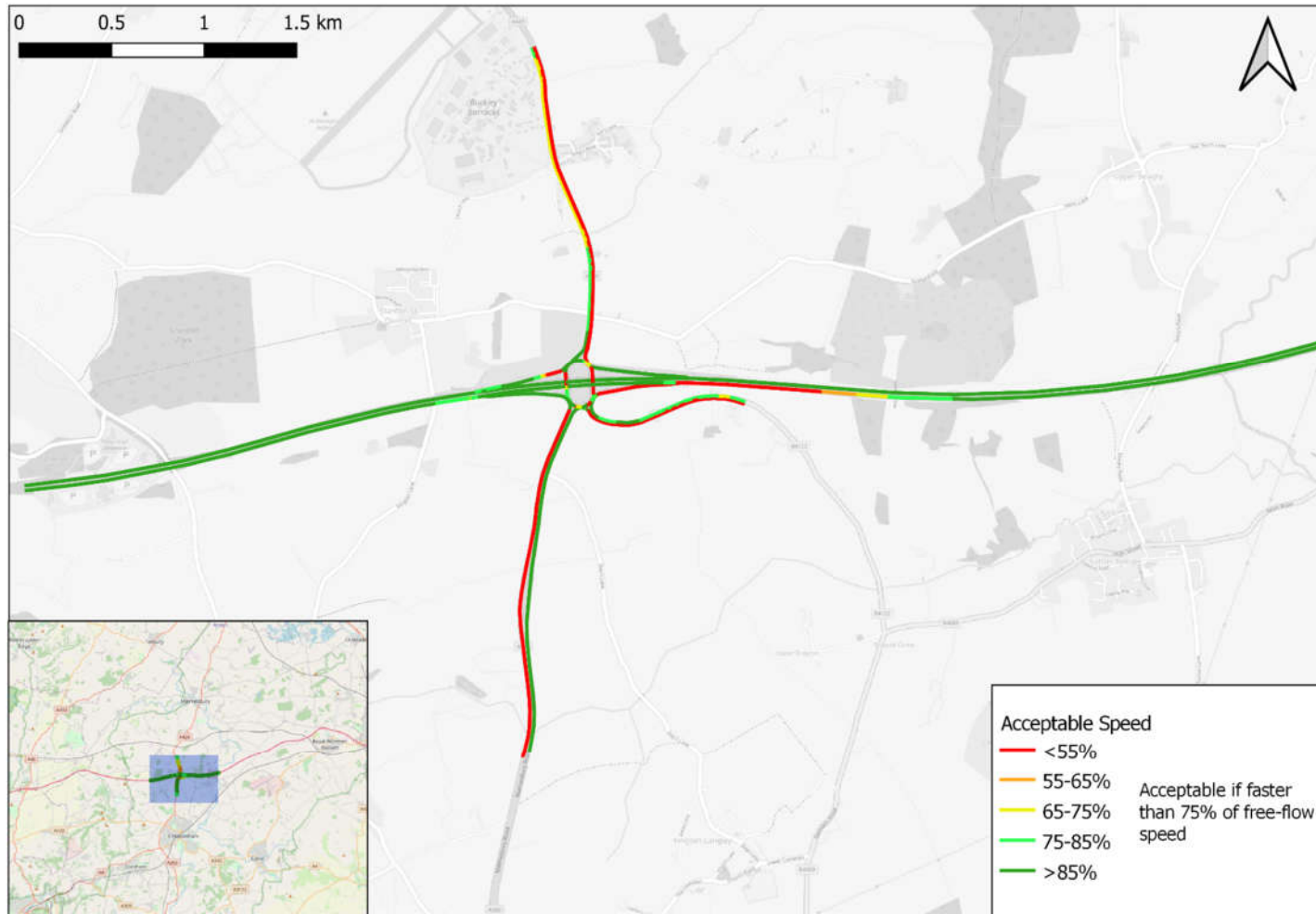
<sup>22</sup> It should be noted that for this exercise the Do Minimum traffic forecasts do not reflect a re-routing response to the levels of delay experienced in the VISSIM model.

A429 North and A350 South. However, in both instances there is a predicted improvement in the maximum queue compared against the Do Minimum.

- 7.2.2.7. Acceptable speed plots have been produced for the 2036 B+ and 2036 Do Minimum scenarios, for both the morning and evening peak. These plots highlight the predicted levels of congestion within the network.
- 7.2.2.8. The morning peak plots are shown in Figure 7-2 and Figure 7-3 for the Do Minimum and B+ scenario respectively, whilst the evening peak plots are shown in Figure 7-4 and Figure 7-5 for the Do Minimum and B+scenarios respectively.
- 7.2.2.9. The plots that in both the morning and evening peak the Do Minimum layout is predicted to struggle to accommodate the proposed level of traffic, with congestion evident on the A429 north, B4122 and A350 south in particular. In the morning peak the Do Minimum acceptable speed plot suggests that it is likely that traffic on the M4 westbound off-slip would block back onto the M4 westbound mainline.
- 7.2.2.10. With Option B+, the acceptable speed plots show vastly improved levels of congestion in both the morning and evening peak, and in both peaks there is predicted to not be interaction between the westbound off-slip and the mainline. The predicted level of congestion on the A429 north, B4122 and A350 south is also reduced compared to the Do Minimum.



Figure 7-2 - 2036 Do Minimum Acceptable Speed: Morning Peak



© OpenStreetMap contributors

Figure 7-3 - 2036 B+ Acceptable Speed: Morning Peak

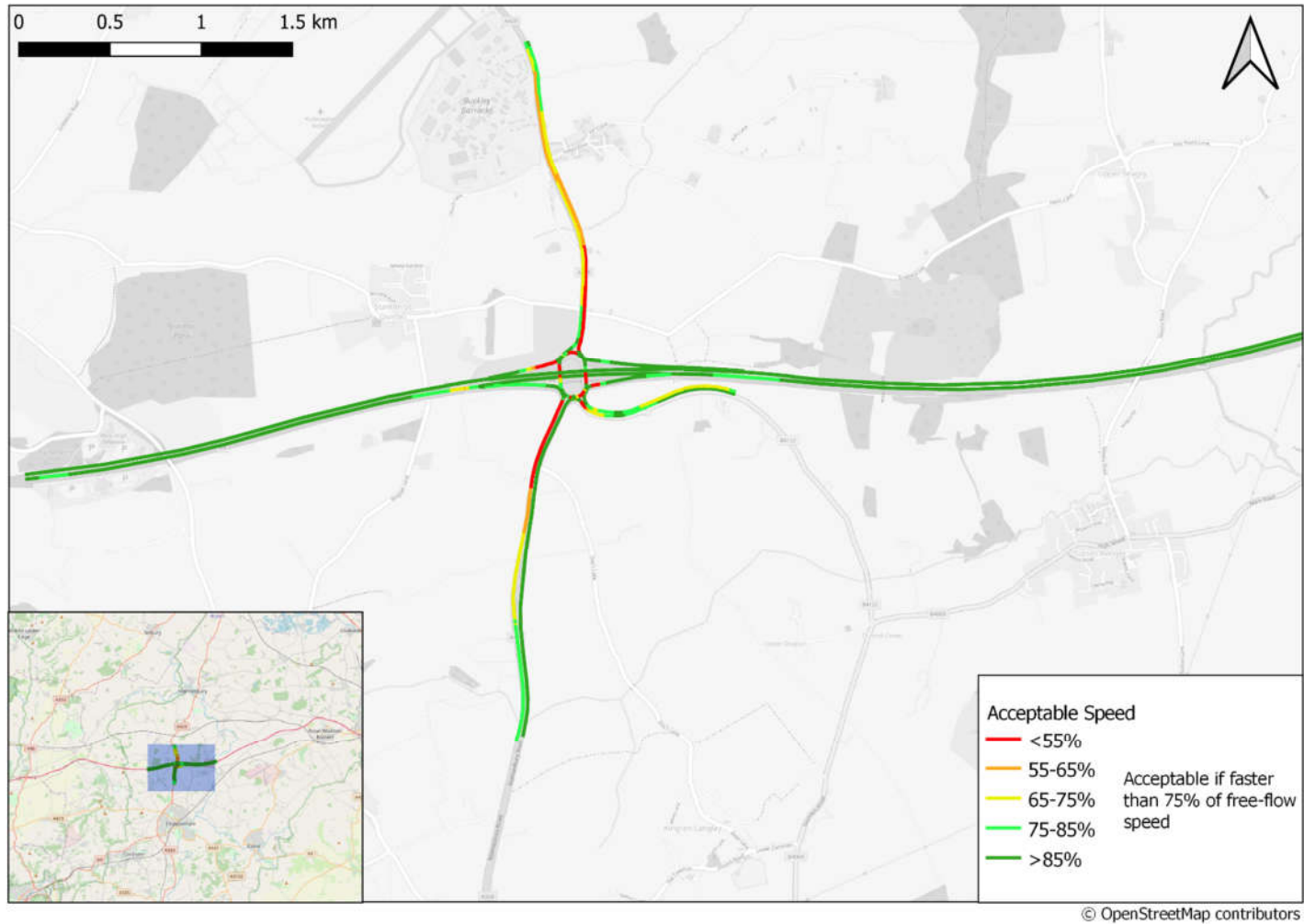


Figure 7-4 - 2036 Do Minimum Acceptable Speed: Evening Peak

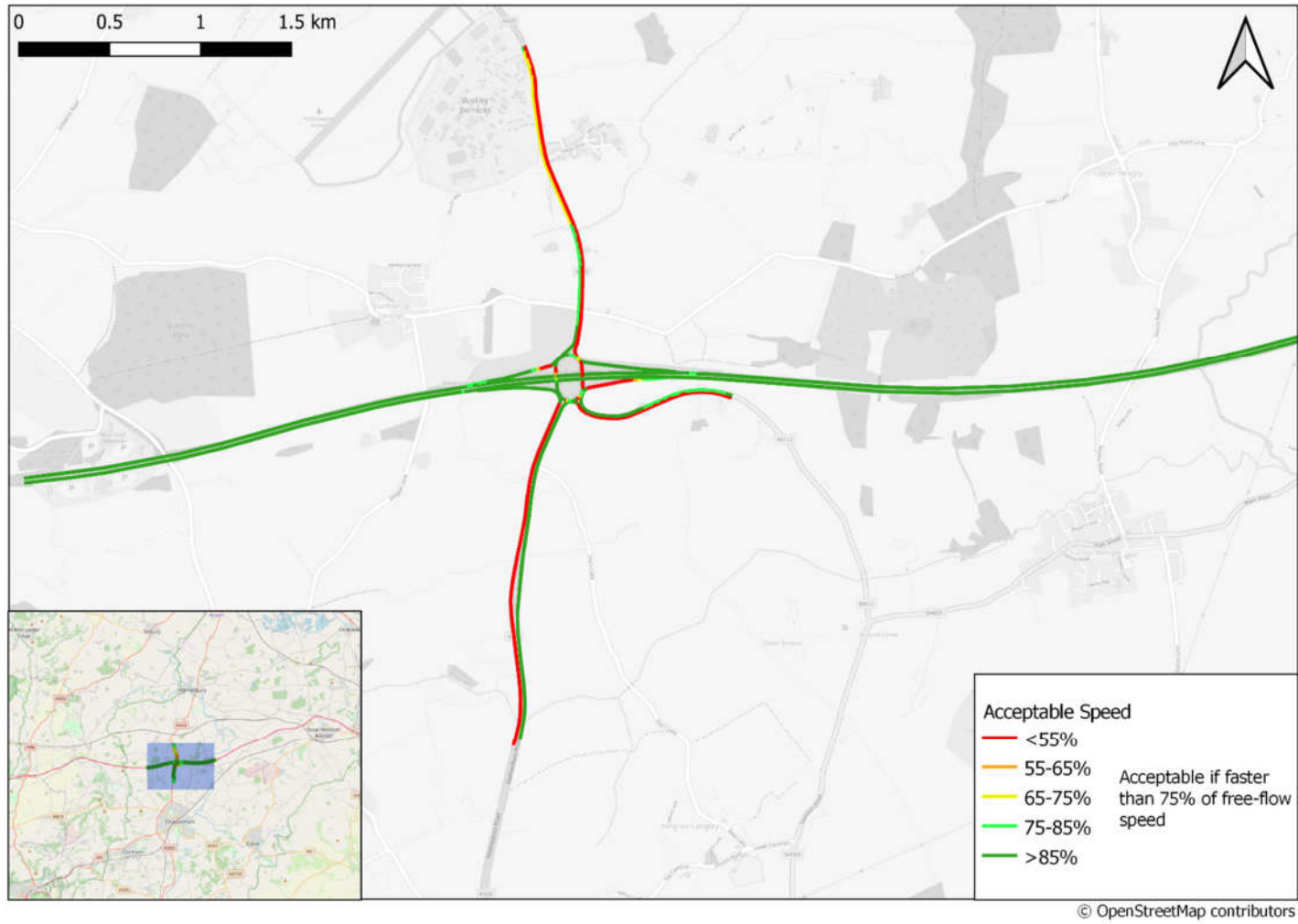
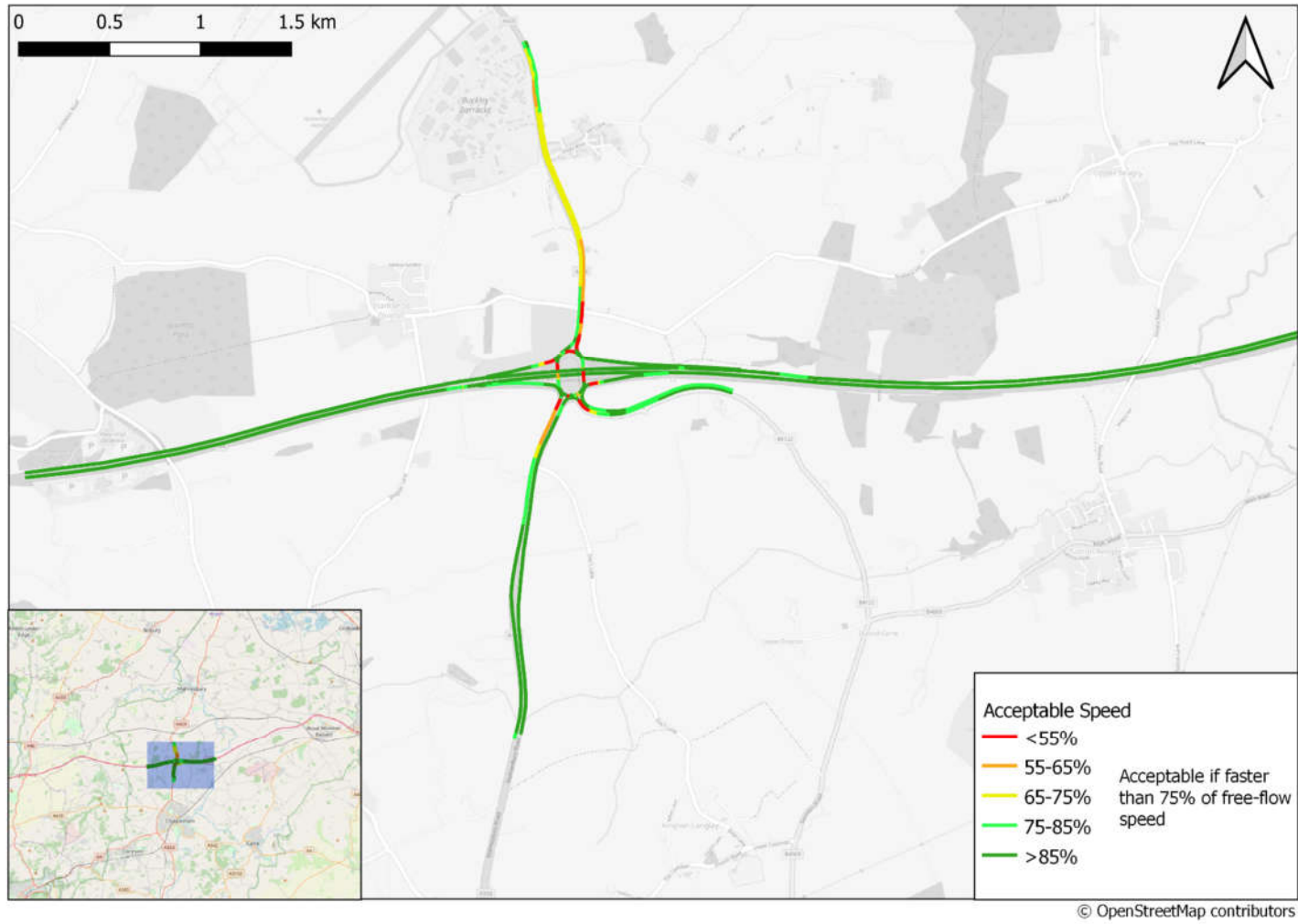


Figure 7-5 - 2036 B+ Acceptable Speed: Evening Peak



### 7.3. Step 8: Document the option assessment process

- 7.3.1.1. Step 8 is the formal report summarising the work undertaken for Steps 1 to 7, as set out in TAG Unit 2.1.2d. This OAR therefore represents Step 8 of the option development process.

## 8. Summary and conclusions

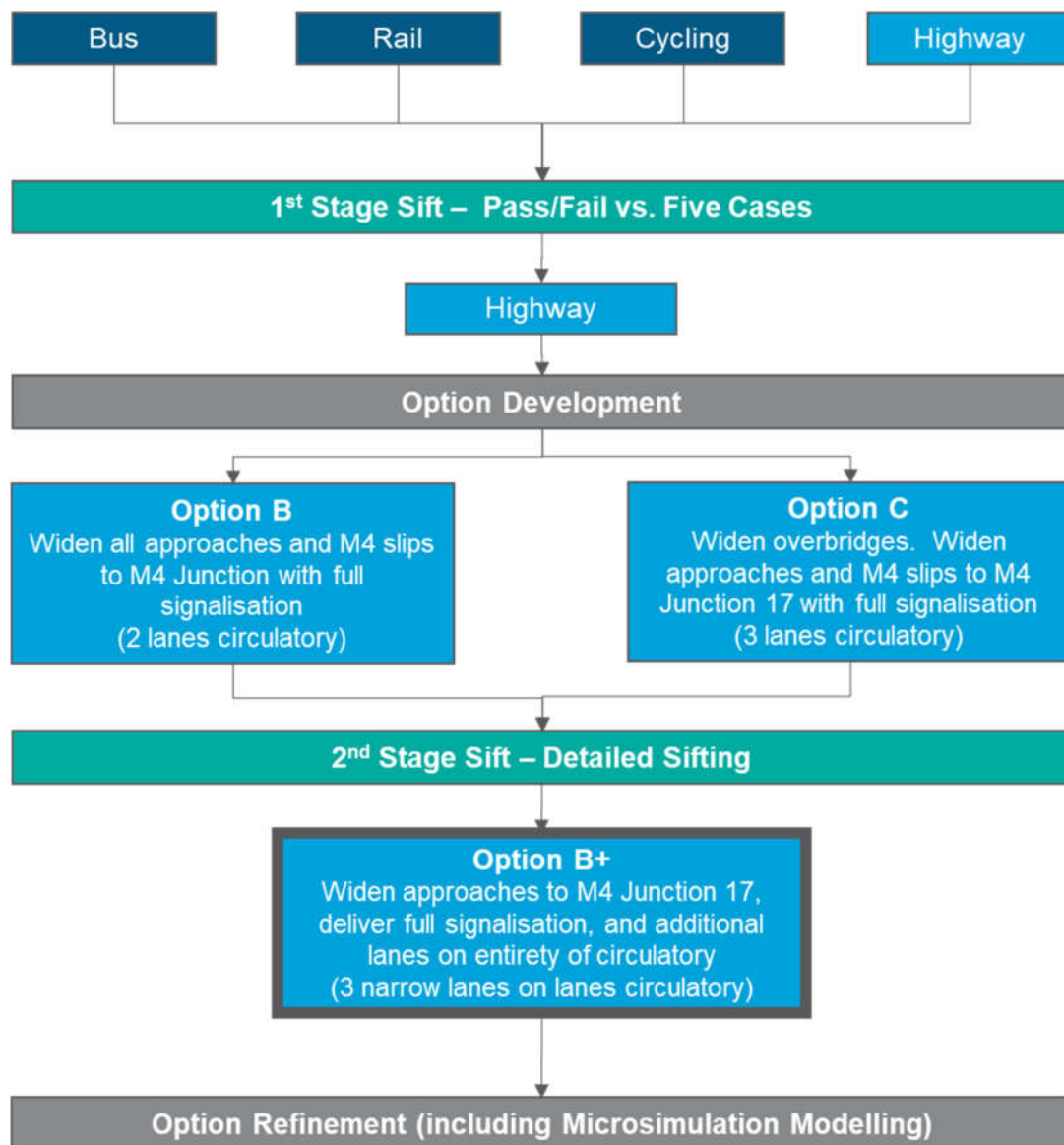
- 8.1.1.1. Based on the sifting and option refinement process (as summarised in Figure 8-1), it is proposed that Option B+ is progressed:

**Option B+ (and design refinements of):** Widen approaches to M4 Junction 17 and deliver full signalisation as well as an additional lane on the entirety of the gyratory (3 narrow lanes to remove requirement to widen the overbridges).

- 8.1.1.2. This option has been confirmed through microsimulation model testing and presents an optimal solution which balances the benefits of three lanes on the circulatory, with the lower cost of running narrow lanes rather than delivering structural alterations.

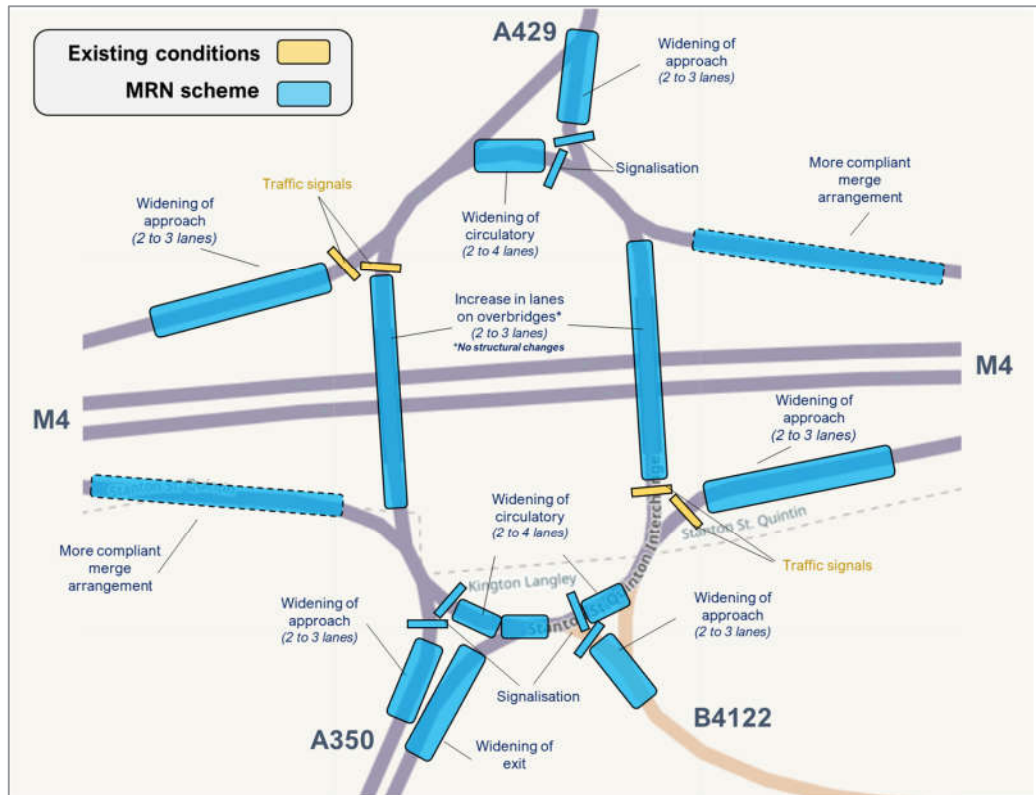
- 8.1.1.3. Further work should be undertaken in collaboration with National Highways to confirm the feasibility of three narrow lanes.

Figure 8-1 - Sifting summary

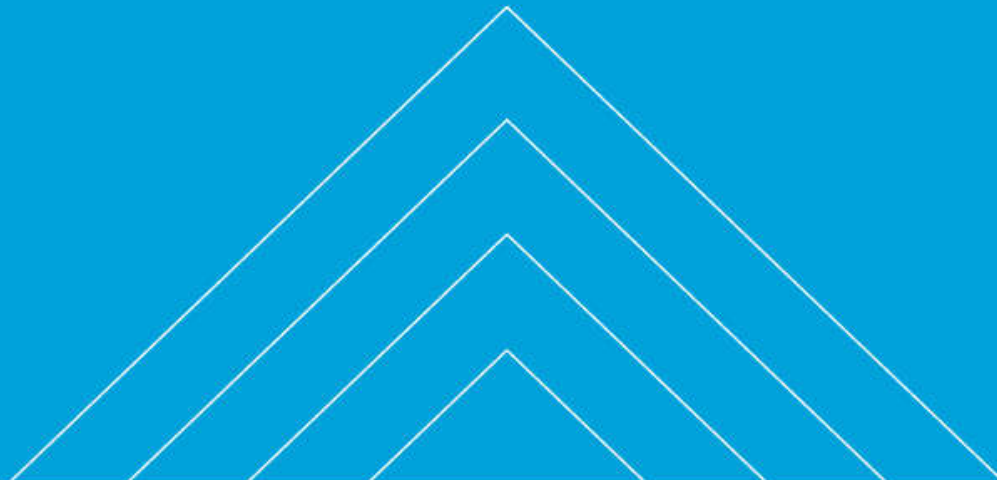


8.1.1.4. The refined Option B+ proposal is illustrated in Figure 8-2. It should be noted that mitigation associated with the Chippenham Gateway development is expected to be delivered in advance of the MRN scheme, comprising signalisation of the A350 and B4122 arms. Assuming this is the case, Option B+ would be delivered incrementally to this.

Figure 8-2 – M4 Junction 17 refined Option B+



# Appendices





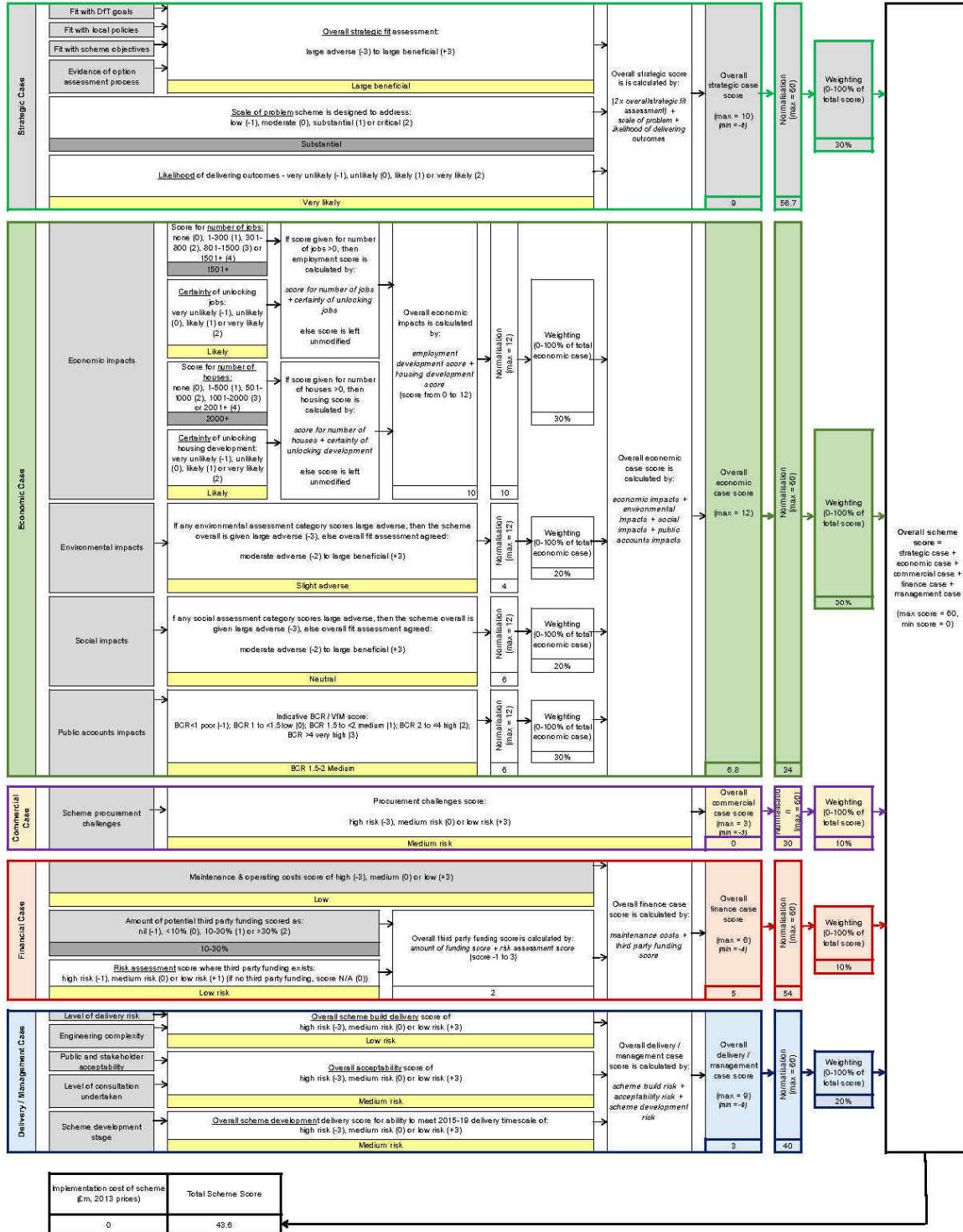
# Appendix A. Option sifting results

## A.1. Option B scoring

**Major Scheme Prioritisation**

Option B: Widen all approaches and M4 slips to M4 Junction with full signalisation (2 lanes, contraflow)

Select options in all yellow cells to calculate scheme score

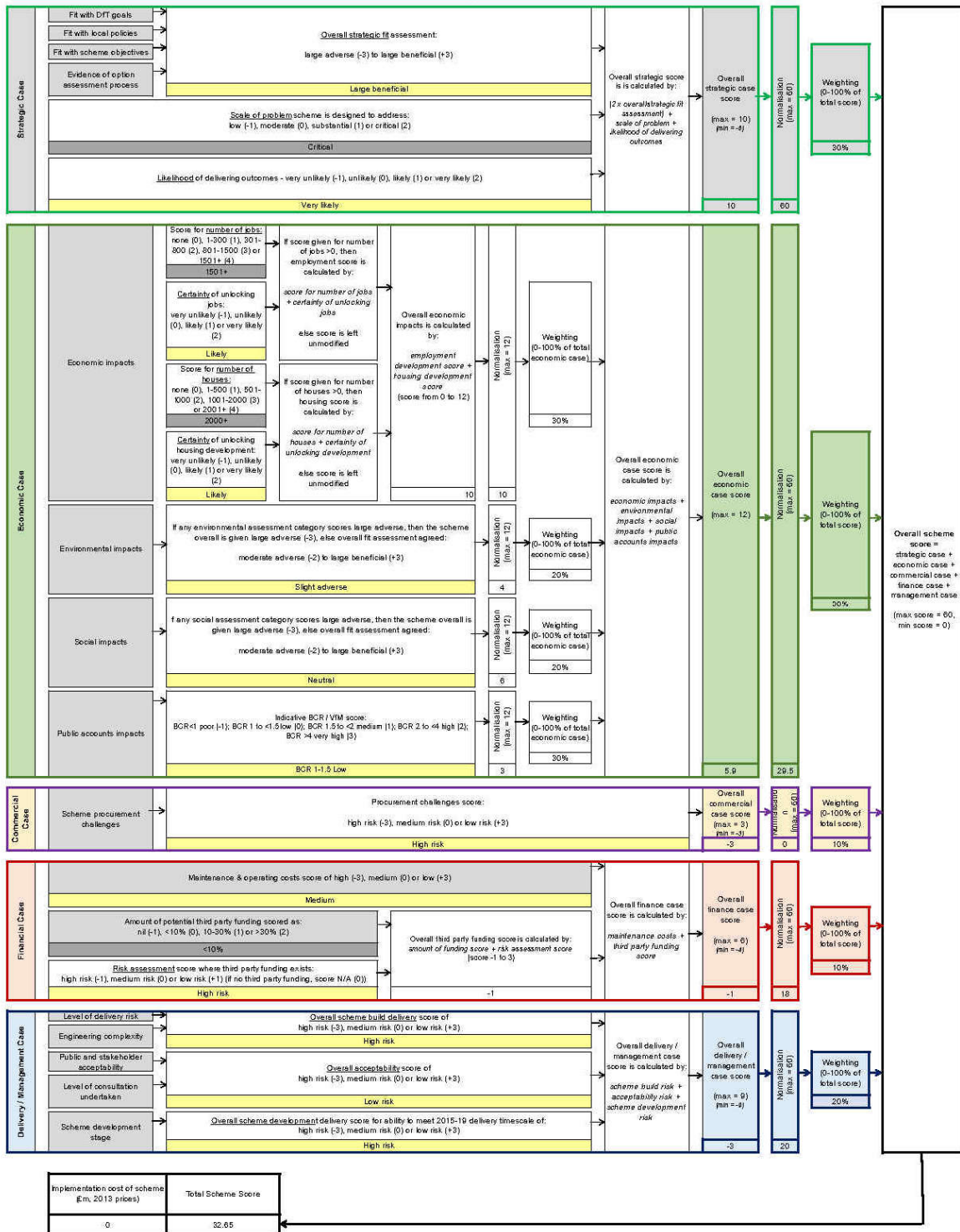


## A.2. Option C scoring

### Major Scheme Prioritisation

Option C: Widen overbridges. Widen approaches and M4 slips to M4 Junction 17 with full signalisation (3 lanes circularity)

Select options in all yellow cells to calculate scheme score



### A.3. Option B+ scoring

**Major Scheme Prioritisation**

Option B: Widen all approaches and M4 slips to M4 Junction with full signalisation (2 lanes circularity)

Select options in all yellow cells to calculate scheme score

