

# Construction of Park and Ride Facility, Land to the North-West of the A41, Bicester, Oxfordshire

Transport Assessment

October 2013

OXFORDSHIRE COUNTY COUNCIL

**APPROVED**

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# Notice

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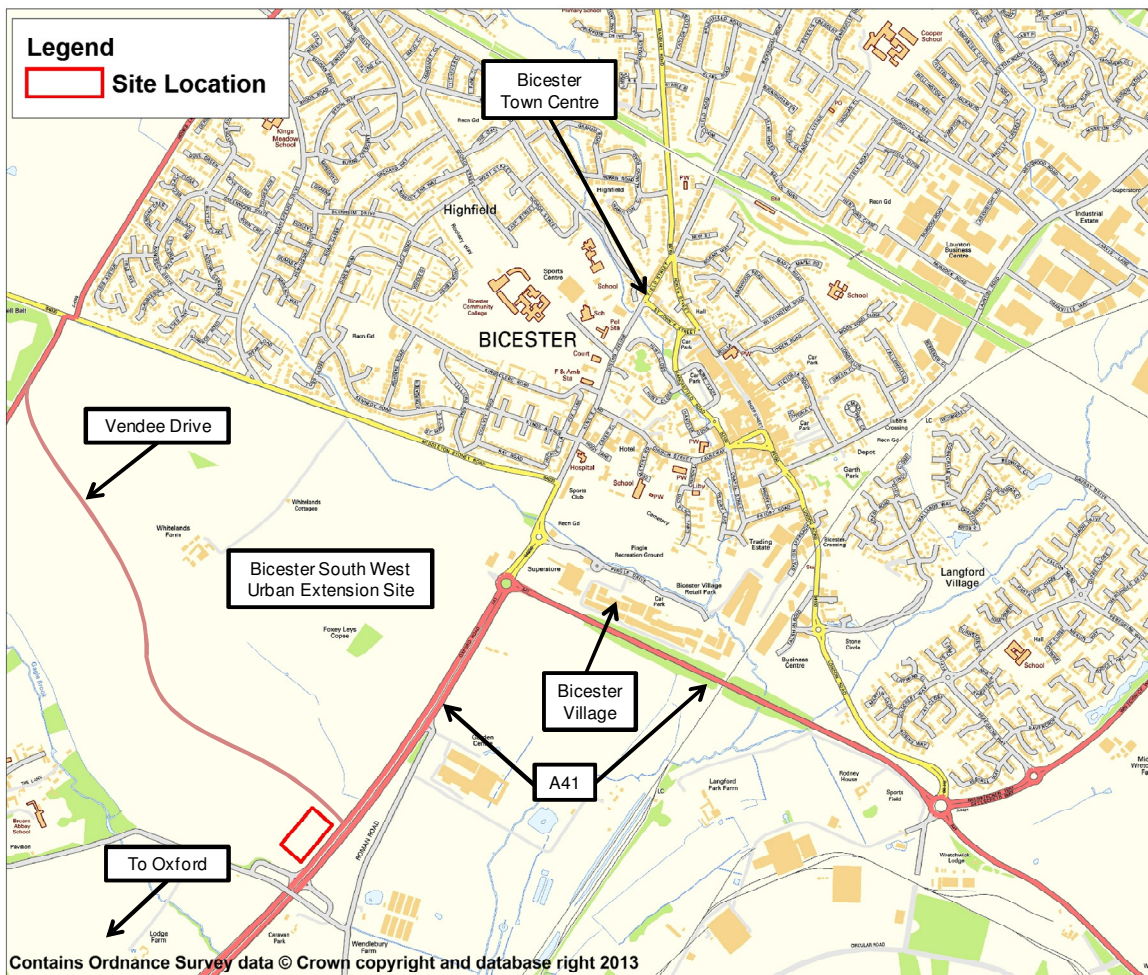
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# 1. Introduction

## Background

- 1.1. Atkins Ltd have been commissioned by Oxfordshire County Council (OCC) to provide a Transport Assessment (TA) and Outline Sustainable Transport Strategy to support the planning application for the proposed Park and Ride (P&R) site located off the A41 to the south of Bicester, Oxfordshire.
- 1.2. The site will consist of 580 parking spaces and 60 cycle storage spaces. Its primary purpose is to act as a P&R site serving Oxford and Bicester. The site will also be used as part of an overall traffic management plan for Bicester which aims to relieve congestion issues related to the existing Bicester Village development. No new dedicated bus services will serve the site, rather, existing bus services will be re-routed into the site.
- 1.3. The site is bounded by the A41 to the east, Vendee Drive to the north and fields to the west. The site location is demonstrated in Figure 1. The site is currently used for agricultural purposes but has no current or historic planning use.

Figure 1. Site Location



## Purpose of the Report

- 1.4. This Transport Assessment will act as supporting information to the planning application. It will assist in evaluating the impact the proposed development may have on the local highway

network. The report also considers the existing sustainable transport network and services and discusses potential gaps and opportunities.

- 1.5. We have agreed the scope of the assessment with Oxfordshire County Council as the Local Highway Authority (LHA). We have agreed the geographical boundaries of assessment, growth factors, assessment scenarios, trip generation and distribution methodologies. In view of the proximity of the site to the M40 Junction 9, the Highways Agency has also been consulted regarding the scope of the TA. All scoping reports and responses are included in **Appendix A** of this report.

## Report Structure

- 1.6. This report includes the following sections:
- Section 2 Provides a brief review of the relevant local and national policy guidance applicable to the site;
  - Section 3 Describes the existing situation in terms of the highway network, accident data, and multi-modal accessibility;
  - Section 4 Describes the proposed development;
  - Section 5 Describes the estimated trip generation and assignment;
  - Section 6 Presents the impact assessment on the local highway network;
  - Section 7 Presents a sensitivity test to take account of the maximum P&R accumulation and a 2031 future year scenario; and
  - Section 8 Provides a summary of findings and conclusions.

## 2. Policy and Guidance Review

2.1. This section of the report reviews the transportation policy considerations which are relevant to the proposed scheme at a national and local level. The following documents have been included as part of this review:

- National Policy:
  - National Planning Policy Framework
  - Government White Paper
  - The Highways Agency and the Local Plan process:
  - The Highways Agency and the Planning Application Process
- Local Policy:
  - Cherwell Adopted Local Plan 1996
  - Non-Statutory Cherwell Local Plan 2011
  - Oxfordshire County Council Local Transport Plan

### National Policy

#### National Planning Policy Framework (2012)

2.2. The National Planning Policy Framework (NPPF) sets out central Government's land use planning policies for England. The document details that the role of the planning system is to deliver sustainable development, of which the central three tenants are economic, social and environmental. Transport places a central role in delivering sustainable development by promoting economic development, improving accessibility and balancing environmental concerns.

2.3. Section four of the framework sets out central Government's objectives in relation to transport. Strong emphasis is placed on supporting developments which encourage a reduction in greenhouse gas emissions and reduce congestion. All developments which will generate significant amounts of demand will require a transport assessment, which should ensure:

- the opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure;
- safe and suitable access to the site can be achieved for all people; and
- improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.

2.4. The Framework details that developments should be designed in such a way that they:

- give priority to pedestrian and cycle movements, and have access to high quality public transport facilities;
- create safe and secure layouts which minimise conflicts between traffic and cyclists or pedestrians;
- incorporate facilities for charging plug-in and other ultra-low emission vehicles; and
- consider the needs of people with disabilities by all modes of transport.

2.5. The P&R development proposed supports central government policy objectives to develop sustainable transport modes and assist in relieving congestion along the A34.



## Government White Papers

- 2.6. The White Paper ***Creating Growth, Cutting Carbon*** (2011)<sup>1</sup> was released which outlines a vision for a transport system that is an engine for economic growth, and one which is greener and safer. The White Paper states that by improving transport links and targeting projects that promote green growth, a dynamic, low carbon economy can be created.

## The Highways Agency and the Local Plan process: A protocol for local authorities, developers and the Highways Agency

- 2.7. As a statutory consultee the HA have a duty to co-operate with local authorities to support the preparation and implementation of their development plan documents. The HA have prepared this protocol to set out how they will work with local planning authorities and developers to support the preparation of sound documents which enable the delivery of sustainable development.
- 2.8. The protocol is intended to be a companion document to Protocol for Dealing with Planning Applications, published in December 2012 and it should be read in conjunction with the National Planning Policy Framework. Both these documents are reviewed separately later in this chapter.
- 2.9. In relation to planning for infrastructure delivery this document states that:

*“the HA will support the principle of the NPPF by encouraging and supporting co-ordinated working across boundaries and with other infrastructure providers to establish the strategic priorities for the network we (the HA) operate.*

*In the first instance, local planning authorities should do what they can to minimise the need for changes to the strategic road network by taking opportunities to reduce the need to travel, especially by private car, and by maximising access to development sites by public transport.*

*In many cases, it is likely that additional capacity to parts of the strategic road network will be identified as necessary to support the delivery of local plans. NPPF requires that there should be a reasonable prospect that planned infrastructure will be deliverable in a timely fashion. We will work with the relevant authorities to help develop sufficiently detailed policies and plans for the additional infrastructure and to ensure that these are reflected in planning for our network.”*

- 2.10. The document stipulates that in planning and operating their network, the HA will take into account the likely impacts of future development on its operation and safety. The HA will use the information within adopted local plans to inform our plans to renew and improve of the network.

## The Highways Agency and the Planning Application Process: A Protocol for Dealing with Planning Applications

- 2.11. This protocol has been produced by the HA to assist developers and their representatives in working alongside the HA when submitting planning applications for development which could have an impact on the strategic road network. It is also to assist Local Planning Authorities and Local Highway Authorities and the HA's own planning teams in the review of planning proposals, to enable prompt and consistent responses.
- 2.12. The Highways Agency on behalf of the Secretary of State for Transport may give directions restricting the grant of planning permission by local planning authorities, where permission would adversely impact the current network or on the route of a proposed future strategic road. Specifically the protocol states that:

*“It is not our [the HAs] role to determine planning applications. We will always work with developers and local planning authorities to find ways to overcome our objections while fulfilling our responsibilities in respect of the network.”*

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<sup>1</sup> DfT. *Creating Growth, Cutting Carbon White Paper* (2011) Available at: <http://www.dft.gov.uk/pgr/regional/sustainabletransport/pdf/whitepaper.pdf>

- 2.13. In relation to scoping the protocol states that the methodology used within the scoping report should normally be consistent with the approach set out in DfT's 'Guidance on transport assessment' unless the characteristics of the proposed development necessitate an alternative approach.

## Local Policy

### Oxfordshire County Council Local Transport Plan 2011 - 2030

- 2.14. The Oxfordshire Local Transport Plan has four central objectives for transport in the county:
- to support the local economy and the growth and competitiveness of the county;
  - to make it easier to get around the county and improve access to jobs and services for all by offering real choice;
  - to reduce the impact of transport on the environment and help tackle climate change; and
  - to promote healthy, safe and sustainable travel.
- 2.15. Transport will assist in achieving growth and prosperity for the country by meeting current and future demand. The population of Bicester could potentially double to 60,000 by the 2030s, supported by employment growth of 15-20,000 jobs in Bicester as well as an additional 10,000 in Oxford. In order to facilitate sustainable movement patterns, the plan's movement strategy focuses on improving links between housing and employment, with an emphasis on supporting high quality public transport. With such significant growth for Bicester, the plan stresses the need for infrastructure to keep pace with and enable development.
- 2.16. The importance of P&R schemes in the county in delivering transport objectives is recognised, with the success of current P&R sites across the county noted. To work from this achievement, the proposed P&R site south-west of Bicester is recognised in the plan as being a strategic transport scheme necessary to support development in the county in the short term. The scheme will support each of the central objectives of the plan by reducing traffic growth and congestion on the A41 and A34, both to Oxford and Bicester and thereby improving access to jobs and services.

### Cherwell Adopted Local Plan 1996

- 2.17. The current local plan covering the Cherwell area was adopted in 1996. Given the age of the plan, the proposed P&R site is not set out in the development plan, though general support is given to P&R sites throughout the district. The plan does give support to measures to reduce congestion and reliance on private transport, recognising the need for an effective public transport system.

### Non-Statutory Cherwell Local Plan 2011

- 2.18. The Cherwell Local Plan was updated in 2011, however, given the changes in the planning system implemented by the current Government it has not been adopted. Whilst the plan is not adopted, it has been approved as an interim planning policy document and so does have some weight in determining development in the district.
- 2.19. The plan recognises the opportunity to integrate a P&R facility within the south west Bicester urban extension, with a view that this service could serve trips into Bicester and Oxford. This will support the plan's principle transport objectives of :
- Helping to reduce pollution and emissions of greenhouse gases by locating development so as to reduce the need to travel especially by private car and encouraging more trips to be made on foot, by cycle and by public transport; and
  - Concentrating development which generates a lot of journeys in locations, which are, or are capable of being, well served by public transport.

### The Cherwell Local Plan Proposed Submission 2012

- 2.20. Though not yet the statutory local plan for Cherwell, the 2012 local plan is the most up-to-date development document for the district and is currently progressing through the adoption process. The plan sets out a vision for the Cherwell district so that *'by 2031, Cherwell District will be an area where all residents enjoy a good quality of life. It will be more prosperous than it is today. Those who live and work here will be happier, healthier and feel safer'*. The plan outlines a number of requirements for the successful delivery of this vision:
- Good transport links and infrastructure base will assist in developing a sustainable economy. Through economic growth in Cherwell, the need for long distance travel to work will reduce ;
  - Enhanced town centres which act as economic, cultural and social hubs;
  - A strong, sustainable and diverse rural economy; and
  - Improved road, rail and public transport links to the facilities and services that people need. In particular, focus will be on measures to manage congestion and improve access to town centres and other services;
- 2.21. The plan recognises the need for modal shift away from cars to public transport. As such, over the life of the plan it is envisaged that public transport will continue to improve and become more demand responsive.
- 2.22. The high level of out-commuting from Bicester to Oxford is noted as a concern. Whilst there is a long term need to reduce the over-reliance on Oxford for employment, it is recognised that Bicester is a commuter town and that as such strong transport connections to Oxford are important for the development of the town. The proposed P&R site has the potential to assist in relieving congestion on the A41/A34 into Oxford, the key arterial route between the two conurbations. By encouraging modal shift for trips on this route, there is potential to reduce carbon emissions whilst constraints on transport infrastructure will be relieved.
- 2.23. The Bicester Masterplan has highlighted the potential for a P&R site in relieving congestion brought about through the economic development of the town. It is noted that a P&R facility is to be delivered as part of the South West Bicester Phase 1 works, and that the facility will *'help reduce pressure on the A34 by encouraging local journeys from Bicester to Oxford to be made by P&R'*.

### Summary

- 2.24. This section of the report has reviewed the policies and guidance which are relevant to the development proposals, and has demonstrated that the proposals accord with and support national and local policies and guidance.

## 3. Existing Situation

### Introduction

- 3.1. This section provides a summary of the existing transport situation on the surrounding highway network within the vicinity of the site. This section of the report has been informed by a desk top study and a site visit which carried out on the 12<sup>th</sup> September 2013 during the AM and PM peak periods.

### Local Highway Network

#### Network Characteristics

- 3.2. The proposed P&R site will be accessed directly off the A41 via the existing A41 / Vendee Drive / Wendlebury Link Road five arm roundabout junction. The junction and Vendee Drive link road (also known as South West Perimeter Road) have recently been constructed to provide access to the South West Bicester Urban Extension. The fifth stub arm of the junction was constructed with the intention that it would provide access to the proposed P&R site.
- 3.3. To the south the A41 meets M40 Junction 9 and forms a signalled roundabout junction with the A34 and M40 north and southbound arms. The A41 south of the access junction takes the form of a dual carriageway and is subject to the national speed limit. On approach to the access junction the speed limit reduces to 40mph.
- 3.4. North of the access the A41 heads towards Bicester and forms a four arm roundabout junction with Oxford Road. The fourth arm of the junction provides access to an Esso petrol filling station. At this point the A41 heads to the east and runs along the south eastern edge of Bicester. Oxford Road continues north into Bicester Town Centre and also provides access to Bicester Village (retail outlet) via Pingle Drive.
- 3.5. The A41 between the site access junction and its junction with Oxford Road takes the form of a dual carriageway. The road is subject to a 40mph speed limit which reduces to 30mph on approach to Oxford Road. A newly constructed access is located between these two points and takes the form of a three arm signal junction. This junction provides access to an existing Premier Inn Hotel but will also provide access to part of the South West Bicester Urban Extension once built out.
- 3.6. Travelling north west from the site access junction Vendee Drive forms a four arm roundabout junction with the B4030 / Howes Lane (A4095) / Middleton Stoney Road. Once again this is a newly constructed roundabout which was built to support access to the South West Bicester Urban Extension. Vendee Drive itself is a single carriageway road subject to a 50mph speed limit. This reduces to 40mph on approach to the site access junction to the south and the B4030 / Howes Lane (A4095) / Middleton Stoney Road junction to the north. Two ghost island right turn junctions are located off Vendee Drive which provide access to the South West Bicester Urban Extension.

#### Network Capacity

- 3.7. During the scoping discussions with the LHA, it was agreed that the following junctions would be assessed within this TA:
- A41 / Vendee Drive / Wendlebury Road - five arm site access junction;
  - Vendee Drive / B4030 / Howes Lane (A4095) / Middleton Stoney Road 4 arm roundabout junction;
  - A41 / Oxford Road / Petrol Filling Station - four arm roundabout junction; and
  - M40 Junction 9 – four arm grade separated signalled roundabout junction.
- 3.8. These junctions were observed during the AM and PM peaks on a site visit undertaken on 13<sup>th</sup> September 2013. The following observations were made.

### **Vendee Drive / A41 / Site Access Junction**

- 3.9. During both the AM and PM peak periods this junction was observed operating within capacity with no significant queues or delays on any arm of the junction. The maximum queue observed at any one time was on the Vendee Drive arm of the junction and consisted of four vehicles but this cleared quickly.

### **A41 / Oxford Road Junction**

- 3.10. This junction was also observed to be operating within capacity during the AM and PM peak periods. The A41 east arm has a dedicated left turn slip lane to the A41 north arm which helps the operation of the junction. During the PM peak small queues of six to seven vehicles started to build on the Oxford Road arm of the junction however these dispersed quickly without inflicting significant delays.

### **Vendee Drive / B4030 / Howes Lane (A4095) / Middleton Stoney Road**

- 3.11. This newly constructed junction was observed operating well within capacity with no significant delays or queues observed. The largest queue of five vehicles was observed on the B4030 arm of the roundabout during the PM peak, however this quickly dispersed and did not result in any significant delays.

### **M40 Junction 9**

- 3.12. During both the AM and PM peak periods this junction was observed operating considerably over capacity. During the AM peak significant queues on the A41 northern arm were observed with delays of up to 6 minutes on approach to the junction on this arm. In addition significant queues were also observed on the M40 southbound off slip arm. On approach to the junction queues extended back along the whole length of the slip road, almost blocking back to the main carriageway of the M40.
- 3.13. It is understood that the Highways Agency have proposals in place to improve this junction. These proposals are described in Appendix G of this report.

## **Public Transport**

### **Access by Bus**

- 3.14. The closest bus stop to the site is located on the A41, approximately 200m north of the site. The stop takes the form of a lay-by with shelter and is served by the Stagecoach operated S5 route (see Figure 2).

**Figure 2. A41 Bus Stop**



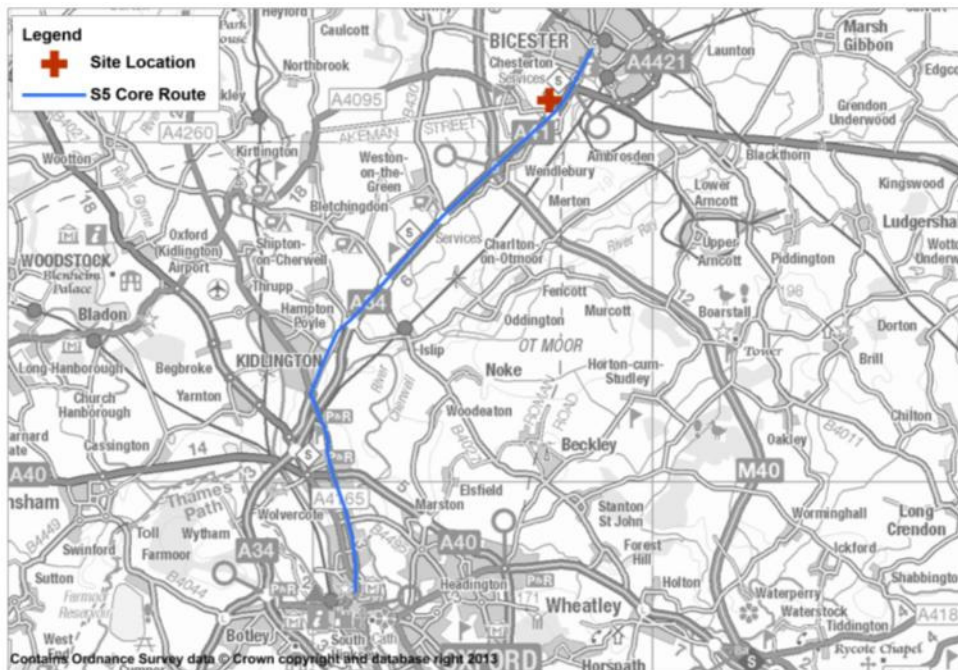
- 3.15. The core S5 route operates between Oxford City Centre and Bicester Town Centre, however certain buses operate beyond Bicester Town Centre, calling at Launton Amrbosden and Arccott. A number of services also serve the Bicester Town Rail station and Bicester North Rail Station as well as the John Radcliffe hospital in Oxford which is a major trip attractor. The frequency of the S5's core Oxford-Bicester route is detailed below in Table 1, with the core route shown in Figure 3. Chapter 4 of this report details the proposed amendments to this service as a result of the P&R development. The service currently takes between 34 and 40 minutes to travel from Bicester Market Square to Oxford Magdalen Street.
- 3.16. Several other routes also operate within Bicester, all of which serve Bicester Town Centre which is approximately 1.2 miles north-east of the site location.

**Table 1. S5 Bus Service Frequency<sup>2</sup>**

Service	Route	Day	Frequency	First Bus	Last Bus
S5	Oxford Magdalen Street – Bicester Market Square	Monday to Friday	3-4 per hour	06:55	00:10
		Saturday	3-4 per hour	07:05	03:10
		Sunday	2 per hour	09:25	23:10
	Bicester Market Square – Oxford Magdalen Street	Monday to Friday	3-4 per hour	05:55	23:15
		Saturday	3-4 per hour	06:20	02:15
		Sunday	2 per hour	08:00	22:30

<sup>2</sup> [http://www.stagecoachbus.com/PdfUploads/Timetable\\_26146\\_S5.pdf](http://www.stagecoachbus.com/PdfUploads/Timetable_26146_S5.pdf)

Figure 3. Core Route of the S5 Bus Service



### Access by Rail

- 3.17. Bicester is served by two railway stations, Bicester North and Bicester Town. Bicester North is the main train station for the town, with services operating to and from London Marylebone, Birmingham Snow Hill and Stratford-upon-Avon at a regular frequency. The station is managed by Chiltern Trains and has 575 car parking spaces and 80 cycle storage spaces.
- 3.18. Bicester Town is located approximately 1.5 miles walk north-east of the site and is currently served by trains to and from Oxford (calling at Islip en-route). Work is currently underway to link the station to the Chiltern Mainline, allowing direct services to London Marylebone from 2015. Plans to link the station to Milton Keynes (and stations en-route) are also at an enhanced development stage, with trains set to operate from 2017. The station is currently managed by Chiltern Railways and has 29 car parking spaces although this is expanding significantly with the redevelopment of the Rail Station.
- 3.19. The S5 bus services, which is proposed to serve the site, currently routes via Bicester Town Rail Station every hour, therefore providing potential for people to use the P&R site to access the station. Although not all services route via the rail station all services do route via Bicester Town Centre which is a short walk to the station.

### Walking and Cycling

- 3.20. The proposed site benefits from excellent existing walking and cycling facilities. Many of these have been recently developed to support the proposed South West Bicester Urban Extension. A plan showing the existing pedestrian and cycle facilities is included in Appendix B.
- 3.21. A shared 2.5m wide footway / cycleway is located along the northern side of Vendee Drive. On approach to the access roundabout the cycle lane crosses over to the southern side of Vendee Drive via a central splitter island (see Figure 4). This then extends to the site access junction and connects to the existing stub arm of the junction which will provide access to the proposed P&R site. This existing route provides excellent footway / cycle links to the site from the proposed South West Bicester Urban Extension. This offers the potential for cycle / walk and ride trips which remove the car element of the journey all together.

**Figure 4. Vendee Drive Footway / Cycleway**



3.22. The Vendee Drive off road footway / cycleway continues in a northerly direction towards Bicester along the western side of the A41. This route extends to the recently constructed signal junction which will serve the proposed South West Bicester Urban Extension. Toucan crossings are incorporated into the junction to allow pedestrian and cyclists to cross on to the eastern side of the A41 (see Figure 5). Here the off road footway / cycleway continues towards the A41 / Oxford Road junction.

**Figure 5. Toucan Crossing**





- 3.23. An on road cycle link also runs along Wendlebury Road which runs parallel to the A41 (see Figure 6). This then becomes an off road route which eventually joins the site access roundabout junction via the Wendlebury Link Road arm. This section of cycle route is part of the National Cycle Network Route 51 (NCN51). NCN51 is a long distance route (214 miles) between Colchester and Oxford via Harwich, Ipswich, Bury St Edmonds, Cambridge and Milton Keynes.

**Figure 6. A41 / Wendlebury Lane Cycle Route**

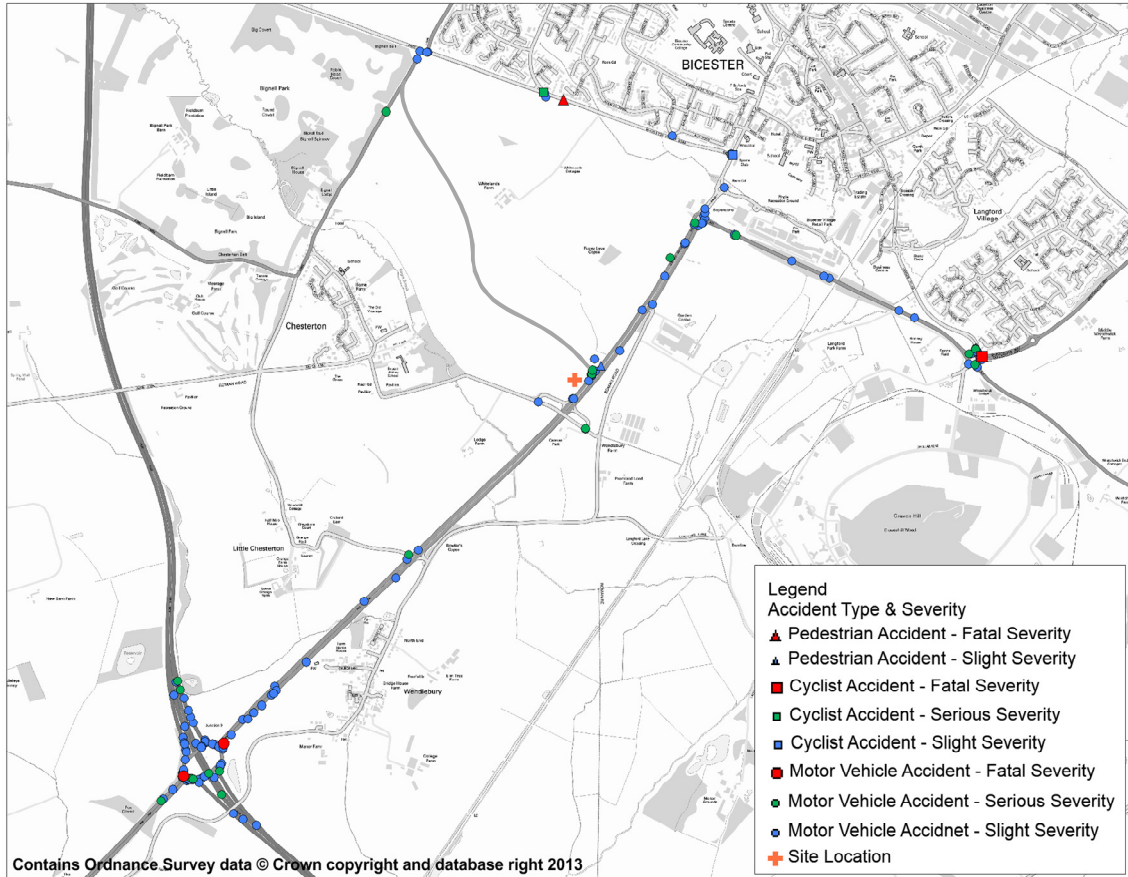


- 3.24. Toucan crossings are also located on the A41 eastern arm of the A41 / Oxford Road roundabout junction. This means a continuous off road route is available from Bicester Village to the proposed P&R site.
- 3.25. Off carriageway walking / cycling links are also provided on the redundant 'Chesterton slip roads' to the south of the site providing for sustainable modes from / to Chesterton.

## Accident Analysis

- 3.26. Personal Injury Accident (PIA) data has been obtained from OCC for the period 01/01/2008 to 30/06/2013 (66 months). Full PIA data is attached in **Appendix C**.
- 3.27. It should be noted that the accident details are a record of the personal injury accidents reported to the police and the data has been transcribed from the original police reports.
- 3.28. **Figure 7** illustrates the broad location of PIAs in the area. **Table 2** and **3** provide a summary of the PIAs at junctions (Any accident occurring with 20m of junction) and local links.

**Figure 7. Personal Injury Accident Locations (PIAs)<sup>3</sup>**



**Table 2. Personal Injury Accidents at Local Junctions**

Junction	Accident Severity			Total	Pedestrians	Cyclists
	Slight	Serious	Fatal			
M40 J9	66	8	2	76	0	0
A41 Junction for Chesterton	4	1	0	5	0	0
A41 / Vendee Drive	8	3	0	11	0	0
A41 / Oxford Road	8	1	0	9	0	0
A41 / A4421 / B4100	13	3	1	17	0	1
B4030 Oxford Rd / Middleton Stoney Rd	4	0	0	4	0	1
Middleton Stoney Rd / Vendee Drive	4	0	0	4	0	0
<b>TOTAL</b>	<b>107</b>	<b>16</b>	<b>3</b>	<b>126</b>	<b>0</b>	<b>2</b>

<sup>3</sup> Given that Vendee Drive has only recently been constructed, this new road has been added to the map.

**Table 3. Personal Injury Accidents at Local Links**

Link	Accident Severity			Total	Pedestrians	Cyclists
	Slight	Serious	Fatal			
A41 (from M40 J9 to jn. for Chesterton)	13	1	0	14	0	0
A41 (from jn. for Chesterton to jn. for Vendee Drive)	1	0	0	1	0	0
A41 (from jn. for Vendee Drive to jn for Oxford Rd)	8	1	0	9	1	0
A41 (from jn. for Oxford Rd to jn. for A4421 and B4100)	6	1	0	7	0	0
B4030 Oxford Road	1	0	0	1	0	0
Middleton Stoney Rd	3	1	1	5	1	1
A4095	0	1	0	1	0	0
Vendee Drive	0	0	0	0	0	0
<b>TOTAL</b>	<b>32</b>	<b>5</b>	<b>1</b>	<b>38</b>	<b>2</b>	<b>1</b>

- 3.29. **Tables 2 and 3** indicate that there were a total of 164 accidents during the study period. A total of 126 accidents (77%) occurred at junctions, with the remaining 38 accidents (23%) occurring on local links.
- 3.30. Across the study area there were five accidents (3%) involving vulnerable road users (pedestrians and cyclists). Four fatal accidents occurred, as well as 21 serious accidents.
- 3.31. A more detailed analysis of the PIAs is provided below.
- M40 Junction 9**
- 3.32. A total of 76 accidents occurred at Junction 9 (including the circulatory, slips, mainline through the junction, and approaches to the circulatory). Two of these accidents have resulted in fatal injuries, whilst eight were classified as serious. There were no accidents involving a pedestrian or cyclist.
- 3.33. One of the fatal accidents occurred as a HGV approached the Junction 9 circulatory. The driver of the HGV overshot the junction and hit a barrier, resulting in fatal injuries to the driver. No other vehicles were involved. The second fatal accident occurred as a motorcyclist on the A34 approach to the circulatory, for unknown reasons, lost control and collided with a barrier, resulting in fatal injuries.
- 3.34. Of the eight serious accidents, five involved motorcycles. There were a variety of factors leading to the serious accidents, including, vehicles using the incorrect lane of the circulatory, vehicles losing control and careless or reckless drivers. Two of the slight accidents involved a bus or coach. The first accident occurred when a distracted car driver hit the back of a car in front which in turn collided with the back of the bus/coach. The second was the result of a bus/coach driver failing to look properly and colliding with the back of a HGV which was waiting to proceed onto the circulatory.
- 3.35. The proposed HA improvement scheme proposed at this junction includes signalisation of the A34 arm of the junction. Providing signal control at this junction in the future, rather than it remaining as a priority give way, is likely to reduce accident rates at the junction.

### **A41 Junction for Chesterton**

- 3.36. Five accidents occurred at this junction, four of which were classified as slight and one as serious. None of the accidents involved a cyclist or pedestrian. The serious accident occurred as a motorcyclist collided with a vehicle turning right at the junction. Three of the slight accidents were shunt type accidents, whilst the fourth occurred as a vehicle was forced to swerve off the road in ice and snow conditions as a result of another vehicle approaching in the incorrect lane.
- 3.37. The Chesterton slip roads are now closed to motor vehicles.

### **A41 / Vendee Drive / Site Access Junction**

- 3.38. The A41/Vendee Drive junction is a five arm roundabout which opened in April 2012 to allow access onto the newly constructed Vendee Drive. There were 11 accidents at the A41/Vendee Drive junction, all of which occurred since April 2011 (when the roundabout was being constructed). Of these eleven accidents, eight occurred during the construction phase, with only three occurring since April 2012.
- 3.39. Of the 11 accidents at the junction, three resulted in serious injuries whilst the remainder were classified as slight. No accidents occurred involving either a cyclist or pedestrian. Two of the serious accidents occurred during the construction period, with the other occurring after the roundabout opened.
- 3.40. Of the serious accidents, two involved the drivers being intoxicated, whilst the third involved a driver approaching the roundabout at speed and hitting the central island, having failed to see warning signs for the roundabout.
- 3.41. The remaining eight accidents were all classified as slight. Two occurred following scheme opening, whilst the remaining six occurred during the construction phase. Two of the accidents involved an intoxicated driver. Two accidents involved a HGV unfamiliar with the new road layout performing a poor manoeuvre at the roundabout and causing an accident. One slight accident occurred as a driver lost control of the vehicle on the approach to roadwork's at the roundabout, whilst the final slight accident was the result of a speeding vehicle, being driven carelessly, losing control on approach to the roundabout and crashing.
- 3.42. The accidents at this junction appear to be largely the result of drivers not being aware of, or driving inappropriately, through the junction (particularly during the construction phase).

### **A41 / Oxford Road**

- 3.43. Nine accidents have occurred at the A41/Oxford Road junction. One of the accidents was classified as serious whilst the remaining eight were classified as slight. None of the accidents involved a pedestrian or cyclist. The serious injury occurred as an intoxicated driver collided with the back of a motorcycle, causing the motorcyclist to fall and sustain serious injuries.
- 3.44. Of the slight accidents, two involved motorcycles. In the first instance, a stationary motorcyclist was hit as an LGV performed an illegal reverse movement at a junction. The second accident occurred as a car travelling too fast collided with the rear of a motorcyclist on the approach to the circulatory.
- 3.45. Four accidents involved drivers failing to judge the path or speed of another vehicle, resulting in a collision.

### **A41 / A4421 / B4100**

- 3.46. There were 17 accidents at this junction. One of these accidents resulted in fatal injuries whilst another three were serious in severity. The remaining accidents were all classified as slight. There were no accidents at the junction involving a pedestrian, however the fatal accident involved a cyclist.
- 3.47. The fatal accident involved a car approaching the circulatory southeast on the A41, turning left onto the A4421 and colliding with a cyclist who was crossing the road from the central reservation.

- 3.48. Three accidents of serious severity occurred at the junction. The first involved the driver having a seizure and colliding with an unknown object. A second, similar accident occurred after an elderly driver had a medical episode and collided with a tree on the circulatory. The final serious accident involved a motorcyclist failing to look properly and losing control after hitting gravel on the carriageway.

#### **B4030 Oxford Road/Middleton Stoney Road**

- 3.49. Four accidents occurred at this junction, with all of the accidents being classified as slight. None of the accidents involved a pedestrian but one involved a cyclist. The accident involving a cyclist occurred as a car at the junction failed to give way to the cyclist at the junction.

#### **Middleton Stoney Road/Vendee Drive**

- 3.50. The Middleton Stoney Road/Vendee Drive junction is a four arm roundabout junction which opened when Vendee Drive was completed, in April 2012. Prior to this, the junction operated as a four armed staggered priority junction. There have been four accidents at this junction, of which all were classified as slight. All accidents at the junction occurred under the previous layout, with none occurring since April 2012.

#### **A41 (from M40 J9 to junction for Chesterton)**

- 3.51. Fourteen accidents occurred along this route. One of the accidents was classified as serious whilst the remaining 13 were classified as slight. None of the accidents involved a cyclist or pedestrian. The serious accident occurred as a driver, attempted to turn left but was travelling too fast and left the carriageway, colliding with a tree.

#### **A41 (from junction for Chesterton to junction for Vendee Drive)**

- 3.52. One accident occurred on this section of the A41, with the accident classified as slight.

#### **A41 (from junction for Vendee Drive to junction for Oxford Road)**

- 3.53. There were nine accidents along this route, of which one was classified as serious and eight as slight. None of the accidents involved a cyclist, though one involved a pedestrian. The serious accident occurred as a driver lost control of their vehicle in wet conditions, leaving the carriageway and overturning.

- 3.54. The accident involving a pedestrian was classified as slight and occurred as a vehicle in the course of a crime collided on the nearside with a second vehicle. The driver of the second vehicle exited the car to assess the damage caused, at which point the driver of the first vehicle drove on, hitting the driver of the second vehicle.

#### **A41 (from junction for Oxford Rd to junction for A4421 and B4100)**

- 3.55. A total of seven accidents were recorded along this link, of which one was classified as serious and the remaining six as slight. None of the accidents involved a pedestrian or cyclist. The serious accident resulted from a car colliding with the back of a HGV, which in turn hit a second HGV in front. The three vehicles had slowed following a fourth vehicle ahead suddenly breaking.

#### **Middleton Stoney Road**

- 3.56. There were five accidents along this link. One accident was classed as fatal, one as serious and three as slight. The fatal accident involved a pedestrian and the slight accident involved a cyclist. The fatal accident occurred when a HGV vehicle collided with a pedestrian who had been jogging along the footway but for an unknown reason entered the carriageway. The serious accident was caused by a car driver failing to give way to a cyclist, resulting in a collision between the two in which the cyclist.

#### **Pedestrians and Cyclists**

- 3.57. Two accidents involving a pedestrian occurred in the vicinity of the site, both of which are described above. There is no evidence to suggest that there is an issue with pedestrian safety within the vicinity of the site.

- 3.58. There were 3 accidents involving cyclists in proximity of the site, one slight, one serious and one fatal accident. The fatal accident occurred at the A41/A421 junction, whilst the other two occurred at minor junctions. There were no common factors/reasons for these accidents to have occurred at these locations other than, by their very nature, junctions where opposing traffic movements take place are where cyclists are most susceptible to collisions with motor vehicles.

### Buses and Coaches

- 3.59. There have been three accidents involving buses or coaches within the vicinity of the site. Two occurred at the M40 J9 junction whilst the third occurred at the A41/Oxford Road junction. All three accidents were classified as slight, with two of them not being caused by the bus/coach but by other vehicles. Given the nature of the accidents, there is no reason for which the accidents occurred at these locations.

### Summary

- 3.60. Whilst all road traffic accidents are regrettable, the PIA data gives no indication of specific concerns relating to the level or nature/pattern of PIAs in this area in relation to the proposed P&R development.
- 3.61. Whilst the prevalence of accidents involving vulnerable road users in the area is noted, accidents involving pedestrians and cyclist make up only 3% of the accidents in the last 66 months. We consider that there are no common locations and/or accident causations which require further consideration and/or mitigation in relation to the development proposals.
- 3.62. The minor redistribution of vehicles entering and existing the proposed P&R site and pedestrian movements related to the proposed P&R development is unlikely to increase the accident rate on the local highway network.

### Traffic Data

- 3.63. To inform this assessment traffic count data has been collected in the vicinity of the site. Existing count data was also provided by OCC for a number of locations. The location, type and date of the count data available has been summarised in Table 4.

**Table 4. Existing Traffic Count Data**

Location	Type of Count	Date Data Collected	Time Coverage
M40 Junction 9	Manual classified turning count and queue length surveys	Wednesday 30 <sup>th</sup> November 2011, Thursday 1 <sup>st</sup> December 2011 and Tuesday 29 <sup>th</sup> November 2011	07:00 – 10:00 and 16:30 – 19:00
Vendee Drive / A41	Manual classified turning count and queue length surveys	Thursday 11 <sup>th</sup> July 2013 Friday 12 <sup>th</sup> July 2013	07:00-19:00 16:00-19:00
Vendee Drive / B4030 / Howes Lane (A4095) / Middleton Stoney Road	Manual classified turning count and queue length surveys	Thursday 11 <sup>th</sup> July 2013 Friday 12 <sup>th</sup> July 2013	07:00-19:00 16:00-19:00
A41 / Oxford Road	Manual classified turning count and queue length surveys	Thursday 11 <sup>th</sup> July 2013 Friday 12 <sup>th</sup> July 2013	07:00-19:00 16:00-19:00
Oxford Road / Pingle Drive	Manual classified turning count and queue length surveys	Friday 1 <sup>st</sup> July 2011	16:00-20:00

- 3.64. The results of these base counts are demonstrated in flow diagrams contained in **Appendix D**.

## Peak Periods

- 3.65. During scoping discussions with the LHA, it was agreed three peak periods would be considered within the TA. These consist of an AM and PM peak on a normal weekday and a Friday PM peak period. The latter is to provide a robust assessment to encompass the Bicester Village peak period.
- 3.66. In order to calculate the peak one hour period within the AM, PM and Friday PM peaks the traffic data outlined in **Table 4** was analysed to confirm the highest one hour peak period across the network.
- 3.67. This analysis concluded the following times were the overall peak periods on the network:
- Normal weekday AM peak – 07:30-08:30
  - Normal weekday PM peak – 17:00-18:00
  - Friday PM peak – 16:45-17:45.
- 3.68. As these periods represent the highest hourly peak flows on the network the base traffic flows from these time periods have been used within the assessments. A review of the flow data showed the PM weekday peak flows on the network were higher than the Friday PM Peak flows. As the same growth rates and levels of committed development will be applied to each period only the weekday PM peak has been considered from this point forward as this represents a worst case.

## 4. Proposed and Committed Development

### Proposed Development

- 4.1. Land has been acquired by OCC under a S106 agreement with Countryside Properties (developer at South West Bicester Urban Extension) to provide a P&R site on land south of Bicester, to the south west of the existing A41 / Vendee Drive roundabout junction.
- 4.2. The proposal is for a P&R facility to serve Bicester and Oxford using existing bus services. It is not proposed to include a terminal building or associated facilities however, high-spec bus shelters will be provided. The site will consist of:
- 580 car park spaces including 14 disabled spaces
  - Cycle storage area with capacity for 60 cycles
  - Bus shelters with perched seating
  - Pedestrian walkways and crossing points
  - Water retention pond
  - Areas of soft landscaping
- 4.3. No welfare facilities will be provided at the site. Electronic Information Boards and Real Time Passenger Information (RTPI) will be available. A barrier system will not be employed at the site but 24 hour CCTV will be installed. The proposed site layout is contained in **Appendix E**.
- 4.4. The Bicester P&R Demand Study which is summarised in the next chapter and that report predicts that demand for the proposed P&R facility is likely to generate a maximum accumulation of 286 vehicles in the future year of 2026. This leaves a surplus of approximately 300 car park spaces. However, it is envisaged that the site will also be utilised as part of an overall traffic management scheme for the area if and when required. This is likely to provide some relief to the highway network in the vicinity of the site, specifically on weekends and public holidays when traffic associated with Bicester Village is at its peak.

### Vehicular Access

- 4.5. Vehicular access to the site is taken from the Vendee Drive / A41 / Wendlebury Road five arm roundabout junction. The fifth arm of the junction is an existing stub which will be used to gain access and egress to and from the site.
- 4.6. It is understood that the access was constructed as part of the South West Bicester Development and was designed in line with relevant DMRB design standards.
- 4.7. The roundabout junction will provide access for both private vehicles and buses serving the site. As vehicles enter the site buses will be directed towards the right hand lane which will route them through to the bus stop area. Private vehicles will be routed towards the left hand lane which will take them into the designated car park area. A height restriction barrier will be provided en route to the car park to restrict HGVs entering the site. In addition speed humps will be positioned on approach to the car park area as a traffic calming measure.
- 4.8. A swept path analysis using a 15m long luxury coach entering, manoeuvring around the site and exiting the site is included in **Appendix F**.

### Pedestrian Access

- 4.9. The site has excellent pedestrian links to the surrounding area. The main pedestrian link into the site is via the Vendee Drive / A41 roundabout junction. The existing 2.5m footway / cycleway located along Vendee Drive will be extended and routed directly into the development. This provides an excellent pedestrian link into the proposed South West Bicester Urban Extension area. There is an existing splitter island located approximately 50m to the north of the



roundabout off Vendee Drive. This provides an assisted crossing location to ease pedestrian access to the site from the proposed residential area. From here the footway / cycleway runs further north towards the A4095 or south linking to the footway / cycleway running alongside the A41 heading towards Bicester.

- 4.10. Although the proposed development is a P&R site, the facility will also allow pedestrians to walk to the site in order to catch the bus providing a 'walk and ride' site for access to Bicester and Oxford. This is likely to provide benefit to the proposed South West Bicester Urban Extension.
- 4.11. A raised pedestrian crossing is proposed within the site linking from the cycle storage area over to the proposed bus shelters. Further information regarding the opportunities available for sustainable travel to the site are discussed in the Sustainable Transport Strategy presented in Chapter 8.

### **Cycle Access**

- 4.12. As discussed above the existing footway / cycleway located along Vendee Drive will be extended into the site. This will provide direct access to the proposed cycle storage area where up to 60 cycles can be stored. This provides opportunity for the site to offer a 'cycle and ride' facility. The proposed cycle link to the site provides excellent links to the local cycle network including NCN 51 which links to Bicester Village.

### **Internal Site Layout**

- 4.13. Buses will be segregated from private vehicles just after they enter the site. The proposed bus stops will be located at the front of the site meaning the buses will only require access to one specific area meaning risk of conflict with other vehicles and pedestrians is reduced. The carriageway in the vicinity of the bus stops is wide enough so that two buses can pass one another if one has stopped to pick up passengers. Buses will be forced to adhere to a one way arrangement which allows buses to enter and exit the site safely in forward gear without the need to reverse.
- 4.14. The bus stops and shelters are located on a wide pedestrian area allowing plenty of space to cater for multiple passengers at one time. The location of the bus stops means that pedestrians are not required to leave the footway when getting on or off the bus therefore reducing the possibility of conflicts. Two main pedestrian walkways will be provided through the car park. These will be flush with the car park surface and demarked using different coloured/textured materials. These pedestrian corridors run from the bus shelters towards the back of the site. Along these routes zebra crossings are proposed where the pedestrian pathway crosses the designated vehicle lanes in the car park. A raised pedestrian crossing is proposed linking from the cycle storage area over to the proposed bus shelters.
- 4.15. It can be concluded that the proposed layout of the site provides a safe environment for pedestrians by reducing the risk of conflicts while also encouraging cyclists and pedestrians to utilise the P&R facility.

### **Public Transport**

- 4.16. Initially, no new dedicated bus services are proposed to serve the site. Rather, the existing services S5 will be routed into the site. The S5 is currently operated by Stagecoach and runs every 15 minutes during the week. The service runs between Oxford Magdalen Street and Bicester Market Square. At present this bus service routes directly past the site, once the site is operational it will make a short diversion into the site to pick up and drop off passengers.
- 4.17. The S5 bus service was significantly enhanced approximately one year ago, not only increasing the frequency of the daytime bus service to four buses per hour using Gold standard double-deck buses, but also providing additional morning peak hour journeys using Oxford Tube vehicles and some new journeys direct from Bicester to Headington. There are currently 8 double deck departures from Bicester to Oxford leaving between 0700 and 0800 and then 4 double deck buses leaving Bicester between 0800 and 0900 on Mondays to Fridays. These are the hours of maximum demand for Park and Ride users.

- 4.18. Once the P&R site is in operation the capacity of the service will be reviewed and the operator will respond to additional demand by providing additional double-deck bus journeys between Bicester and Oxford. Furthermore, other services and operators may wish to serve the site and provide services to other destinations.

## Committed Developments

- 4.19. This section outlines the specific committed developments and highway schemes that are considered within this TA. It has been agreed with OCC that the following development will require assessment within the report:

- Tesco Proposed Relocation
- Bicester Business Park
- Land South West of Bicester (Kingsmere Development Phase 1 and 2)
- NW Bicester Eco Development
- Graven Hill (1,900 dwellings which has outline planning permission)
- Bicester Village Phase 4

- 4.20. It is noted that some of these developments are yet to receive planning permission however, it is recognised that they are all in advanced stages of the planning process and should therefore be included within the Transport Assessment.

- 4.21. The following committed highway schemes are also included within the TA, a drawing showing the proposed schemes is included in Appendix G:

- Oxford Road / A41 / Pingle Drive / Tesco Access Junction proposed signal junction.
- M40 Junction 9 proposed capacity improvements.

- 4.22. Each of the committed developments is now discussed in more detail.

### Tesco

- 4.23. It is proposed to develop a new Tesco store located on the south east corner of the A41 / Oxford Road junction. The site comprises of 8,135m<sup>2</sup> GFA Tesco Food Store complete with 600 parking spaces, an 8 island petrol filling station and Dot Com facilities for 16 delivery vans.

- 4.24. The existing Tesco store located adjacent to Bicester Village will be demolished once the new store is operational. Access to the proposed Tesco store is located off the A41 via a proposed signal junction as shown in Appendix G.

- 4.25. Outputs were obtained from the Tesco TA in order to determine the change in traffic flow likely to occur on the network once the store was operational. The traffic flows from the existing store were taken off the network and the flows from the proposed store have been added. As the development traffic for an AM peak was not provided as part of the TA the estimate AM peak traffic was derived from comparing AM and PM trip rates obtained from the TRICS database to factor the PM peak flows to an AM peak flow.

### Bicester Business Park

- 4.26. The proposed Bicester Business Park (BBP) is located on the same plot as the proposed Tesco store, to the south east corner of the A41 / Oxford Road junction. The proposed development will consist of 60,000m<sup>2</sup> of which 53,000m<sup>2</sup> will be B1 office use and the remainder being used as a hotel. However, the proposed Tesco store will replace the consented hotel and some of the consented office space, leaving 45,000m<sup>2</sup> of offices within the retained BBP area under the current masterplan. Access to the business park will be shared with the proposed Tesco store.

### South West Bicester Urban Extension (Kingsmere Phase 1 and 2)

- 4.27. Phase 1 of the Kingsmere Development comprises of the provision of 1,585 residential units, approximately 20,000sqm of B1 / B2 employment land, a hotel, a health village, a local centre

(including 1,000sqm of employment) and associated amenities, a sports centre, open space and community facilities including two primary schools and secondary school provision.

- 4.28. Vendee Drive otherwise known as the new perimeter road has been constructed to provide access to the development. The new link road connects to the A41 via a new 5 arm roundabout. The fifth arm of the junction was constructed for the purpose of providing access to the proposed P&R site. The link road also connects to the A4095 and Middleton Stoney Road via a newly constructed 4 arm roundabout to the north of the development. Secondary access to the development is taken further north off the A41 via a newly constructed signal junction which also provides access to a new hotel development.
- 4.29. Phase 2 of the Kingsmere development consists of up to 700 dwellings including 30% affordable housing. Proposals also include the introduction of an extra care facility, a primary school and retail unit.
- 4.30. Access to the development is gained off Middleton Stoney Road and the newly constructed Vendee Drive. It is understood between 150 and 200 dwellings associated with this development are already occupied, however in order to ensure a robust assessment these existing trips have not been removed from the network.

### North West Bicester Eco Development – Exemplar Site

- 4.31. NW Bicester will be phased over time and in the emerging Local Plan is expected to deliver 1,793 houses and 67,320 sqm of employment by 2031. The Exemplar site which currently has planning permission consists of:
- 394 residential units (including 30% affordable units);
  - 135 pupil primary school (including nursery unit);
  - A Co Operative Food store (550m<sup>2</sup>);
  - Pharmacy, Hairdressers and Post Office (220m<sup>2</sup>);
  - Offices above shops (1,100m<sup>2</sup>);
  - A 40 place children's nursery (350m<sup>2</sup>);
  - Community centre (350m<sup>2</sup>);
  - An Eco Pub (190m<sup>2</sup>);
  - An Eco Business Centre (1,800m<sup>2</sup>); and
  - Biomass Energy Centre (400m<sup>2</sup>).
- 4.32. This section of the proposed Eco development has been taken into account as part of this TA. The remainder of the site is taken included in the 2031 sensitivity test reported later in the TA.

### Graven Hill

- 4.33. The Graven Hill development is a former MoD site which has outline planning permission for 1,900 homes and local centre including schools, shops and recreational facilities.
- 4.34. The site is located to the south east of Bicester and is accessed from the A41.

### Bicester Village Phase 4

- 4.35. In relation to transport matters, the main crux of the proposals concerns the introduction of highway improvements in order to serve Bicester Village and provide betterment for local people. These improvements were discussed earlier in this report and are included in **Appendix G**.
- 4.36. The application proposes the demolition of the existing Tesco food store and extension of the Bicester Village Outlet Shopping Centre. The application will provide:
- 5,735m<sup>2</sup> Class A1 (gross external area) of new class A1/A3 floor space;
  - 372 car parking spaces;
  - Landscaping works; and
  - Highway improvement works

- 4.37. With regard to the development it should be noted that the proposals will result in a net increase in floor area of 4,273m<sup>2</sup>.

### Phasing of Committed Developments

- 4.38. The proposed opening year of the P&R site is late 2014. It is understood that development of the proposed Tesco Store will be completed by late 2014 / early 2015. The proposed highway improvements for the Tesco site access and A41 / Oxford road junction are likely to be in place.
- 4.39. The proposed extension to Bicester Village will not start until the existing Tesco store has been demolished which will not occur until the proposed store is operational. Therefore, the extension Bicester Village and the proposed improvements to the Pingle Drive / Oxford Road junction are unlikely to be complete until late 2016. Therefore this has only been included in the future year scenario (2019).
- 4.40. Similarly it is understood that the Graven Hill development is unlikely to commence by 2015, and as such this has only been included within the future year scenario.
- 4.41. Flow diagrams showing the level of committed development added to the network are contained in **Appendix G**.

## 5. Trip Generation and Assignment

### Bicester P&R Demand Study

- 5.1. OCC commissioned Halcrow to undertake the Bicester P&R Demand Study (2011). The aim of the study was to develop a demand profile for the P&R site, identify the number of spaces required for the site and identify complementary measures to help facilitate the success of the P&R. The full report is contained in **Appendix H** of this TA.
- 5.2. In order to assess the estimated demand at Bicester P&R, two modelling tools were utilised. Firstly, the Central Oxfordshire Transport Model (COTM) was used. This is a WebTAG compliant variable demand model. The initial purpose of COTM was to assess major infrastructure projects in central Oxfordshire, to secure funding for schemes. It has subsequently been used for more localised option testing for strategies and schemes, such as the assessment of Local Development Framework (LDF) proposals and the transport impact of major developments. A park & ride sub-model was included in COTM, and this was used as part of the assessment of capacity issues at the Thornhill P&R site.
- 5.3. COTM has been used to estimate future demand at the Bicester P&R site, as well as providing trip demand and distribution data. Generalised trip cost information has been provided for input into the second modelling tool, a bespoke logit spreadsheet model.
- 5.4. COTM is calibrated to the existing situation, which implicitly takes into account the amount of suppressed demand. However, it does not actively model specific capacity of individual park & ride car parks, and as such the future-year demand is 'unconstrained' by any capacity limitations. The logit model was developed to work with the results of COTM assessments to better understand the demand in the car park. Model forecasts are AM peak hour (08:00-09:00) so a conversion model to the hour-by-hour profile of a car park was developed, which uses the COTM and logit model results to provide demand profiles for the car park throughout the day.
- 5.5. Details of the methodology and assumptions applied in both COTM and the logit model are set out in the full report contained in **Appendix H**.

### Trip Generation

- 5.6. The demand profile calculated in the Bicester P&R Demand Study has been used to estimate the likely trip generation to and from the proposed site.
- 5.7. Data derived from counts of vehicle movements at the existing P&R sites at Water Eaton and Peartree has been used to assess the potential daily profile of use of the proposed Bicester P&R site and resulting maximum car park accumulations. These are dedicated P&R sites serving trips from the same overall catchment area as the proposed Bicester site.
- 5.8. Count information from the existing Peartree P&R and Thornhill P&R sites were used to generate profiles based on using the AM and PM peak hours to build up a picture of movements on an average weekday, Saturday and Sunday.
- 5.9. The Bicester P&R Demand Study estimated accumulation at the Bicester P&R site is forecast to be a maximum of 286 in 2026 (224 in 2007 base year) on a weekday. A demand profile for the entire day was then generated for the 2007 base year and 2026 future year. In order to ensure a robust assessment the demand profile for the 2026 future year has been used throughout this TA. This takes account of the future year demand and ensures a robust assessment.
- 5.10. The estimated demand profile for a future year of 2026 is set out in **Table 5**.

**Table 5. 2026 Demand Profile**

Time	Weekdays			Saturdays			Sundays		
	In	Out	Accum	In	Out	Accum	In	Out	Accum
05:00	2	0	2	-	-	-	-	-	-
06:00	22	2	22	4	-	4	1	-	1
07:00	76	4	93	9	0	12	6	0	7
<b>08:00</b>	<b>89</b>	<b>5</b>	178	26	2	36	16	2	21
09:00	55	4	230	40	3	73	36	4	53
10:00	38	5	262	50	6	117	40	5	89
11:00	30	10	282	53	12	158	30	10	109
12:00	22	18	286	45	20	183	19	16	112
13:00	17	25	277	37	27	193	10	23	99
14:00	11	32	256	23	33	183	4	30	73
15:00	8	42	222	11	43	152	3	33	43
16:00	7	65	164	6	54	104	3	30	15
<b>17:00</b>	<b>7</b>	<b>92</b>	80	5	56	52	2	11	6
18:00	5	59	26	5	32	25	2	3	4
19:00	3	17	12	2	12	15	-	2	2
20:00	3	7	8	2	7	11	-	1	1
21:00	3	5	5	1	5	7	-	1	-
22:00	2	5	2	2	7	2	-	-	-
23:00	1	2	0	1	3	-	-	-	-

- 5.11. **Table 5** shows that the maximum demand for the P&R site falls on a normal weekday. The maximum accumulation of 286 vehicles is achieved at 12:00. It is also predicted that the largest number of trips to arrive and depart the site will occur in the AM (08:00-09:00) and PM peaks (17:00-18:00) where a total of 94 and 99 two way trips are predicted respectively.
- 5.12. This TA will focus on the AM and PM peak impact of the development. Therefore the estimated AM and PM peak trips estimated to arrive and depart the site in these peak periods is set out in **Table 6**.

**Table 6. Estimated AM and PM Peak Trip Generation**

AM Peak (08:00-09:00)			PM Peak (17:00-18:00)		
Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
89	5	94	7	92	99

### Trip Generation - Sensitivity Test

- 5.13. It was agreed with OCC that a sensitivity test will be undertaken which will assume the P&R site will be utilised to full capacity. For the purpose of the sensitivity test it has been assumed that the maximum capacity of the site is for 600 spaces. The sensitivity test will assume that all the spaces are full at 12:00 which was when the Bicester P&R Demand Study predicts the site will reach its maximum accumulation. The adjusted weekday demand profile based on maximum accumulation of 600 vehicles occurring at 12:00 is set out in **Table 7**.

**Table 7. Demand Profile Sensitivity Test – Maximum Accumulation**

Time	Weekdays		
	In	Out	Accumulation
05:00	4	0	4
06:00	46	4	46
07:00	159	8	197
<b>08:00</b>	<b>187</b>	<b>10</b>	<b>373</b>
09:00	115	8	480
10:00	80	10	550
11:00	63	21	592
12:00	46	38	<b>600</b>
13:00	36	52	583
14:00	23	67	539
15:00	17	88	468
16:00	15	136	346
<b>17:00</b>	<b>15</b>	<b>193</b>	<b>168</b>
18:00	10	124	55
19:00	6	36	25
20:00	6	15	17
21:00	6	10	13
22:00	4	10	6
23:00	2	4	4

5.14. The estimated trip generation of the site used within the sensitivity tests is set out in **Table 8**.

**Table 8. Estimated AM and PM Peak Trip Generation (Sensitivity Test – Maximum Accumulation)**

AM Peak (08:00-09:00)			PM Peak (17:00-18:00)		
Arrivals	Departures	Two-way	Arrivals	Departures	Two-way
187	10	197	15	193	108

## Trip Distribution and Assignment

5.15. The Bicester P&R Demand Study provided an indication of the likely origins of those utilising the P&R facility. This information has been used to determine the likely trip distribution and assignment of those using the proposed P&R site.

5.16. **Table 9** sets out the likely origins and destinations of users of the site. This information was extracted from COTM.

**Table 9. Origins of Trips Using the P&R Site**

Origin	Destination		Origin Regardless of Destination
	Oxford	Bicester Centre	
<b>Proportion of total demand</b>	<b>56%</b>	<b>44%</b>	<b>100%</b>
Bicester	36%	66%	49%
Northamptonshire	16%	1%	9%
North Cherwell	11%	2%	7%
South Cherwell (north of Bicester)	10%	8%	9%
Banbury (and surrounds)	8%	1%	5%
South Cherwell (around Bicester)	6%	9%	7%
North Buckinghamshire	5%	4%	5%
Milton Keynes	5%	1%	3%
Warwickshire	3%	0%	2%
Other (mostly Oxfordshire)	0%	5%	2%
Oxford	0%	3%	1%

- 5.17. **Table 9** above shows the likely origins of visitors to the site dependant on their final destination and the overall origins regardless of destination. This information has been used to produce a gravity model which will form the basis of the distribution and assignment of the proposed development traffic.
- 5.18. It should be noted that the Bicester P&R Demand Study states “*The figures for the ‘Bicester’ area aggregates results for all sectors used in the logit model to represent Bicester (north-east, north-west, east, west, south-west and centre). This is because strict analysis of the results for Oxford as a destination indicates that trips using the park & ride site only originate from the north-west sector of Bicester. Trips originating from only one sector would not be expected; hence the results have been aggregated to overcome this.*”
- 5.19. Based on the origins of those visiting the site a number of assumptions have been made regarding the route these vehicles take when arriving at site. **Table 10** outlines these assumptions. For the purpose of this assessment it has been assumed that vehicles will use the same route when departing the site as they did to arrive.

**Table 10. Distribution Assumptions**

Origin	Assumed Approach to Site
Bicester	60% from Oxford Rd A41 from central Bicester. 15% from A4095 Howes Lane via Vendee Dr. 5% from Middleton Stoney Road via Vendee Dr. 20% from A41 from east of Bicester.
Northamptonshire	90% from M40 J9 SB. 10% from Oxford Rd A41 from central Bicester.
North Cherwell	90% from M40 J9 SB (Jn 4 arm A). 10% from B4030 via Vendee Dr (Jn 3 arm A)
South Cherwell (north of Bicester)	35% from M40 J9 SB. 45% from central Bicester. 20% from A4095 Howes Lane via Vendee Dr.
Banbury (and surrounds)	100% M40 J9 SB.
South Cherwell (around Bicester)	25% from Oxford Rd A41 from central Bicester. 25% from A41 from east of Bicester. 25% from B4030 via Vendee Dr. 25% from A34 via M40 J9 RAB.
North Buckinghamshire	40% from Oxford Rd A41 from central Bicester. 60% from A41 from east of Bicester.
Milton Keynes	60% from Oxford Rd A41 from central Bicester. 20% from M40 J9 SB. 20% from B4030 via Vendee Dr
Warwickshire	5% from A34 via M40 J9 RAB. 95% from M40 J9 SB.
Other (mostly Oxfordshire)	50% from A34 via M40 J9 RAB. 25% from M40 J9 SB. 25% from M40 J9 NB.
Oxford	100% from A34 via M40 J9 RAB.

- 5.20. Flow diagrams showing the estimated distribution and assignment of vehicle visiting the site are contained in **Appendix I**.

## Reassignment of Trips

- 5.21. P&R services make it possible for at least part of a trip to be made without a car. This may help reduce congestion on the approaches to the Bicester and Oxford and reduce parking in sensitive central locations. It is considered unlikely that the P&R itself will actually be a trip generator in its own right, especially during the AM and PM peaks which are traditionally made up of commuter trips. It is likely a high percentage of vehicles attracted to the P&R site will currently drive to Bicester or Oxford. The introduction of the P&R site will likely intercept traffic as they arrive or depart Bicester.
- 5.22. This fact was recognised within the Demand Study which predicted that approximately one third of the vehicles to use the proposed Bicester P&R site will transfer from the existing Peartree and Water Eaton sites located just outside Oxford. Given the recent introduction of parking charges



at Pear Tree and the imminent introduction of parking charges at Water Eaton the transfer assumptions could be higher than reported in 2011.

5.23. The Bicester P&R Demand Study predicts that 44% of traffic accessing the site will have a final destination of Bicester. Furthermore, 20% of all traffic having a final destination of Oxford is likely to originate from Bicester. This means that potentially up to 64% of the total traffic accessing the P&R is already on the local highway network either accessing Bicester or travelling out of Bicester towards Oxford.

5.24. In order to take account of the potential reassignment of trips on the network it has been assumed that all traffic predicted to have a destination of Oxford but originate from Bicester is likely to already exist on the local network. Similarly, it is assumed all traffic which has a predicted destination of Bicester will also already exist on the local network regardless of where it originates from. The assumptions regarding how these vehicles currently leave Bicester to access Oxford or enter Bicester from the surrounding districts is presented in **Table 11**. It is recognised that some traffic currently routing towards Bicester would not currently travel past the proposed P&R site and therefore, would provide no reductions in traffic on the junctions being assessed with this TA. When considering the existing routing of the P&R traffic any trips that do not originate in Bicester and have a destination of Oxford have been excluded from the analysis and it's assumed these trips are not currently on the local highway network.

**Table 11. Existing Routing of P&R Trips**

Destination Oxford	
Origin	Assumed Route taken to Oxford
Bicester	60% from Oxford Rd A41 from central Bicester. 15% from A4095 Howes Lane via Vendee Dr. 5% from Middleton Stoney Road via Vendee Dr. 20% from A41 from east of Bicester.
Destination Bicester	
Origin	Assumed route taken to Bicester
Bicester	100% from within Bicester (i.e. no traffic would not currently travel along the network under consideration within the TA).
Northamptonshire	100% from north of Bicester via A43 (i.e. no traffic would not currently travel along the network under consideration within the TA).
North Cherwell	100% from NW Bicester, via B4100.
South Cherwell (north of Bicester)	5% from B4030. (i.e. 95% of traffic would not currently travel along the network under consideration within the TA).
Banbury (and surrounds)	Traffic would not currently travel along the network under consideration within the TA.
South Cherwell (around Bicester)	50% from A34. 35% from A41 East. 15% from B4030.
North Buckinghamshire	50% from A41 from east of Bicester (i.e. 50% of traffic would not currently travel along the network under consideration within the TA).
Milton Keynes	Traffic would not currently travel along the network under consideration within the TA.
Warwickshire	85% M40 Southbound, 10% Jn 3 B4030, 5% other off local network under assessment.
Other (mostly Oxfordshire)	50% from A34 via M40 J9. 25% from M40 Southbound. 25% from M40

Destination Oxford	
Origin	Assumed Route taken to Oxford
	Northbound .
Oxford	100% from A34 via M40 J9

5.25. Traffic flow diagrams showing how the traffic expected to access the P&R site would currently access Oxford and Bicester is contained in **Appendix I**. In addition the net increase / decrease in trips on the network as a result of the P&R site are presented in **Appendix I**. In summary the benefits to the network include:

- In the AM peak, south of the site access junction, there is predicted to be a decrease of 17 and 18 vehicles in a southbound direction along the A41 and A34 respectively.
- In the PM peak, south of the site access junction, there is predicted to be a decrease of 17 and 19 vehicles on the A41 and A34 respectively.
- In the AM peak, north of the site access junction, there is predicted to be a decrease of 3 vehicles on the A41 in a northbound direction.
- In the PM peak on the A41 East arm there is predicted to be a decrease of 5 vehicles in a westbound direction.
- In the PM peak, north of the site access junction, there is predicted to be a decrease of 2 vehicles on the A41 in a southbound direction.

5.26. It is recognised that the P&R site will have some impact on the local highway network as traffic re-routes towards the development. However, as demonstrated above the proposed development is likely to bring some benefits to the highway network in particular on principle routes such as the A34 and A41.

5.27. No consideration has been made regarding the potential trip reductions which could occur through 'walk / cycle and ride' trips. The potential to promote such trips is contained in the Sustainable Transport Strategy Contained in Chapter 8.

## 6. Impact Assessment

### Percentage Impact Assessments

- 6.1. The 1994 IHT Guidelines<sup>4</sup> contained thresholds of 10% and 5% for levels of development traffic relative to background traffic, below which impact is not deemed to be significant. Whilst this is no longer deemed an acceptable mechanism since it creates an incentive in favour of locating development where high levels of background traffic already exist<sup>5</sup>, a percentage impact assessment has been undertaken and is presented in **Table 12**.
- 6.2. The purpose of this assessment is to demonstrate the low significance of impact the development is likely to have on the network considering the reassignment of trips. The impact assessment demonstrates the percentage increase or decrease in traffic flows on each arm of the junction and the junction as a whole.

**Table 12. Percentage Impact Assessment**

Junction	Approach Road	AM Peak	PM Peak	Friday PM Peak
		% Impact	% Impact	% Impact
A41 / Vendee Drive / Site Access Junction	Vendee Drive	3.3	0.6	0.6
	A41 North	2.2	-0.1	-0.2
	Wendlebury Road Link	0	0	0
	A41 South	1.8	-1.0	-1.1
	P&R Site Access	0*	0*	0*
	<b>Total Junction</b>	<b>2.2</b>	<b>2.1</b>	<b>2.3</b>
A41 / Oxford Road	A41 South	-0.2	2.0	2.2
	Esso Access	0	0	0
	Oxford Road	2.8	-0.5	-0.5
	A41 East	0.6	0.1	0.1
	<b>Total Junction</b>	<b>0.8</b>	<b>0.7</b>	<b>0.8</b>
Vendee Drive / B4030 / Howes Lane (A4095) / Middleton Stoney Road	Vendee Drive	0.3	1.3	1.3
	B4030	0.7	0	0.0
	Howes Lane	1.0	0.2	0.2
	Middleton Stoney Road	0.4	-0.2	-0.2
	<b>Total Junction</b>	<b>0.7</b>	<b>0.6</b>	<b>0.6</b>
A41 / A34 / M40	M40 North	1.3	0.1	-
	A41 East	-1.0	-1.2	-
	M40 South	0.0	0	-
	A34 West	0.0	-0.6	-
	<b>Total Junction</b>	<b>0.1</b>	<b>0.1</b>	<b>-</b>

<sup>4</sup> 'Guidelines for Traffic Impact Assessment', published by the Institution of Highways and Transportation (1994)

<sup>5</sup> 'Guidance on Transport Assessments' published by the DfT (2007)

\*no existing traffic on this arm the junction

- 6.3. **Table 12** demonstrates that the proposed P&R site has a minimal impact on the surrounding highway network during the AM and PM peak. As expected the Vendee Drive / A41 site access junction shows the largest percentage impact as this is the first point of impact on the highway network. With this considered no arm is showing a percentage impact of more than 5%.

## Capacity Assessments

### Technical Scope

- 6.4. During scoping discussions with the LHA it was agreed that the traffic impact assessment would focus on the following junctions:
- A41 / Vendee Drive / Wendlebury Road - five arm site access junction;
  - Vendee Drive / B4030 / Howes Lane (A4095) / Middleton Stoney Road - four arm roundabout junction;
  - A41 / Oxford Road / Petrol Filling Station - four arm roundabout junction; and
  - M40 Junction 9 – four arm grade separated signalled roundabout junction.
- 6.5. In addition to this the impact assessment also considers two proposed highway schemes. These include:
- A41 / Oxford Road proposed signalisation; and
  - M40 Junction 9 proposed improvement scheme.
- 6.6. The following assessments will be used to determine the impact the proposed development is likely to have on the operational capacity of the highway network.
- 6.7. For the purpose of assessing the operational capacity of the network a worst case scenario has been adopted. It has been assumed all traffic predicted to arrive and depart the site during the AM and PM peak are actually new trips on the network and the reassignment of existing journeys has been disregarded.

### Scenarios

- 6.8. A number of scenarios have been assessed within this chapter as summarised below:
- 2013 Base Year
  - 2014 Opening Year
  - 2014 Opening Year + Committed Development
  - 2014 Opening Year + Committed Development + Proposed P&R
  - 2019 Future Year
  - 2019 Future Year + Committed Development
  - 2019 Future Year + Committed Development + Proposed P&R
- 6.9. For simplicity the results for the most critical scenarios in terms of demonstrating the development impact have been presented in this summary. Traffic flow diagrams for the scenarios listed above are contained in **Appendix J**. Please note that as stated previously the scenarios presented assume no reassignment of trips on the local network and therefore present a worst case.

### Growth Factors

- 6.10. Where required all base traffic counts have been growthed up to a base year of 2013 using the 2009 National Trip End model adjusted by TEMPro (6.2). To ensure a robust assessment the base traffic has been growthed to an opening year of 2014 and future year of 2019 using the

same methodology. The growth factors used within the assessment are summarised in **Table 13**.

**Table 13. Growth Factors**

Time Period	AM Peak	PM Peak
2011 – 2013 (Trunk Roads)	1.016	1.017
2011 – 2013 (Principal Roads)	1.015	1.015
2013 – 2014	1.007	1.007
2013 - 2019	1.071	1.074

6.11. Adding growth to the base traffic as well as individually adding committed development traffic will result in an element of double counting. However, this ensures a robust assessment is carried out.

### Modelling Period

6.12. The assessments were carried out for the following weekday AM, PM and Friday PM peak periods as detailed previously in this report.

- Midweek AM Peak (07:30-08:30);
- Midweek PM Peak (17:00-18:00); and
- Friday PM Peak (16:45-17:45).

6.13. As discussed previously in the report a review of these flow periods revealed that the PM peak weekday flows were higher than Friday PM peak flows. In the future year scenarios, the same growth factors, committed development traffic and P&R trips have been added to the network in both the weekday and Friday PM peak scenarios. Therefore, for simplicity and to ensure we are presenting a robust assessment only the AM and PM midweek peak periods have been presented as these represent a worst case.

6.14. In terms of modelling packages either Junctions 8 (ARCADY module) or LinSig have been utilised depending on form of the junction, ARCADY for priority controlled roundabouts and LinSig for traffic signals. Junctions 8 software allows a range of traffic flow profiles to be adopted when undertaking peak period model runs.

6.15. In order to decide on the most appropriate flow profile for each capacity assessment, 2013 junction turning counts were analysed for each of the roundabout junctions. These are summarised in **Table 14**.

**Table 14. Analysis of Junction Inbound Flow Profiles by 15-minute Intervals**

Time		A41/Vendee Drive		A41/Oxford		Vendee Drive/B4030	
From	To	Total Vehs	% of Hourly Flow	Total Vehs	% of Hourly Flow	Total Vehs	% of Hourly Flow
<b>AM Peak</b>							
07:30	07:45	771	26.5%	831	25.6%	342	23.9%
07:45	08:00	730	25.1%	867	26.7%	399	27.9%
08:00	08:15	710	24.4%	750	23.1%	380	26.6%
08:15	08:30	701	24.1%	794	24.5%	310	21.7%
<b>PM Peak</b>							
17:00	17:15	855	24.9%	982	24.7%	422	25.7%
17:15	17:30	840	24.5%	1008	25.3%	401	24.4%
17:30	17:45	860	25.1%	993	24.9%	403	24.5%
17:45	18:00	876	25.5%	999	25.1%	417	25.4%

6.16. Table 14 demonstrates that total inbound flow for all 3 junctions remains relatively consistent across the hour both the AM and PM peak hour time periods. Consequently, a flat profile was considered most suitable for use in each junction capacity assessment.

## Capacity Assessments

### A41/Vendee Drive/Site Access

6.17. The existing A41 / Vendee Drive / Site Access five arm roundabout was modelled using Junctions 8 (ARCADY module). Geometries for the model were taken from proposed design drawings issued as part of the South West Bicester Urban Extension. These dimensions were confirmed against on-site measurements. Output results from the base model were validated against queue length surveys and onsite observations which demonstrated little evidence of queuing at any of the locations throughout the day.

6.18. Assessment results for the A41/Vendee Drive/Site Access junction are displayed in **Table 15**. A Ratio of Flow to Capacity (RFC) of 0.85 indicates that the specific arm of the junction is approaching capacity.

6.19. The Level of Service (LOS) has also been presented within the summary results table. The LOS (Highway Capacity Manual (HCM 2000)) outputs show the unsignalised, and equivalent signalised, level of service values for the time segment, based on the average delay per arriving vehicle. The transportation LOS system uses the letters A through F, with the definitions below being typical:

- A = Free flow
- B = Reasonably free flow
- C = Stable flow
- D = Approaching unstable flow
- E = Unstable flow
- F = Forced or breakdown flow

**Table 15. Vendee Drive / A41 / Site Access ARCADY Summary**

Approach Arm	AM (07:30 – 08:30)				PM (17:00 – 18:00)			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
<b>2013 Base Year</b>								
Vendee Drive	0.32	3.9	0.24	A	0.19	4.23	0.16	A
A41 North	1.09	2.64	0.50	A	0.91	2.25	0.48	A
Wendlebury Rd	0.11	3.81	0.09	A	0.19	3.49	0.16	A
A41 South	0.75	2.15	0.41	A	1.5	3.08	0.59	A
P&R Site Access	0	0	0	A	0	0	0	A
<b>2014 Opening Year + Committed Development</b>								
Vendee Drive	1	7.18	0.49	A	0.49	5.97	0.33	A
A41 North	1.67	3.49	0.61	A	1.56	3.1	0.61	A
Wendlebury Rd	0.14	4.94	0.12	A	0.25	4.73	0.20	A
A41 South	1.51	3.05	0.58	A	2.77	4.66	0.73	A
P&R Site Access	0	0	0	A	0	0	0	A
<b>2014 Opening Year + Committed Development + Park &amp; Ride Site</b>								
Vendee Drive	1.06	7.39	0.51	A	0.53	6.5	0.35	A
A41 North	1.81	3.68	0.63	A	1.64	3.21	0.62	A
Wendlebury Rd	0.15	5.18	0.12	A	0.26	4.91	0.21	A
A41 South	1.62	3.24	0.60	A	2.84	4.76	0.73	A
P&R Site Access	0.01	4.03	0.01	A	0.18	6.88	0.15	A

Approach Arm	AM (07:30 – 08:30)				PM (17:00 – 18:00)			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
<b>2019 Future Year + Committed Development</b>								
Vendee Drive	1.55	10.7	0.6	B	0.92	10.47	0.48	B
A41 North	3.8	6.2	0.78	A	3.38	5.29	0.77	A
Wendlebury Rd	0.25	7.91	0.19	A	0.45	7.72	0.31	A
A41 South	2.41	4.14	0.69	A	8.72	11.73	0.9	B
P&R Site Access	0	0	0	A	0	0	0	A
<b>2019 Future Year + Committed Development + Park &amp; Ride Site</b>								
Vendee Drive	1.66	11.19	0.62	B	1.05	11.96	0.51	B
A41 North	4.28	6.82	0.80	A	3.52	5.50	0.78	A
Wendlebury Rd	0.27	8.54	0.20	A	0.47	8.06	0.32	A
A41 South	2.64	4.48	0.71	A	8.89	11.92	0.90	B
P&R Site Access	0.01	5.12	0.01	A	0.37	14.38	0.27	B

- 6.20. The 2013 base model demonstrates that all arms of the junction are operating well within capacity during the AM and PM peaks consistent with onsite observations and queue length surveys. The maximum RFC is observed on the Vendee Drive approach during the PM peak period with a value of 0.59, well within the accepted value of 0.85.
- 6.21. For the 2014 opening year, the ARCADY assessment shows that the junction still operates within capacity with the inclusion of both committed development traffic and the P&R site. Comparing the scenario which includes the P&R site with the scenario which only includes committed development traffic reveals very little difference in queues and delay for any of the existing approach arms. In the PM peak, the highest RFC seen on Vendee Drive reaches 0.73 in the 2014 + committed + P&R scenario; still well within acceptable capacity limits. The maximum delay experienced is for traffic exiting from the P&R site during the PM peak with an average of 7.99 seconds per PCU, but no significant queuing is observed for this arm. Both arms of the A41 (where the highest volume of traffic approaches the junction) experience very little queuing, with all average queues below a value of 3 PCUs for both opening year scenarios.
- 6.22. The 2019 future year PM peak scenario (not including the P&R) outputs demonstrate that the A41 southern arm has an RFC of 0.90, thus slightly exceeding the accepted limit of 0.85. This results in delays of 11.73 seconds per Passenger Car Unit (PCU) for traffic using this approach and an average queue of 9 PCUs. Despite an RFC above 0.85 the LOS is still judged to be “reasonably free flow”. For the Friday PM peak scenario, the value of 0.82 is also close to capacity but significantly lower in the AM peak. All other arms of the junction continue to operate within capacity limits, with average queues of less than 4 PCUs in all time periods assessed.
- 6.23. Inclusion of the P&R site makes very little difference to the operation of the junction in the 2019 future year, with negligible increases in average queue length and delay for existing approaches. The RFC on the A41 southern arm remains at 0.90 during the PM peak (with marginally increased delay of 11.92 seconds) and within capacity for the AM peak time period. All average queues for the other existing arms remain lower than 4 PCUs with the exception of Wendlebury Road during the AM peak, with an average queue of 4.28 PCUs. As with the opening year P&R scenario, the greatest delays are experienced by traffic exiting from the P&R site itself during the PM peak, with an average delay of 14.38 seconds per PCU. However, once again there is no significant queuing for the P&R approach, with an average value of 0.49 PCUs. It is considered evident that the P&R site would not have a material impact on the operation of the junction in the AM and PM peaks.
- 6.24. The full summary outputs are contained in **Appendix K**.

### A41/Oxford Road

- 6.25. The A41 / Oxford Road junction has been modelled using Junctions 8 (ARCADY module). The geometric inputs to the model were based on OS mapping and backed up by onsite observations

and geometric measurements. The bypass function within Junctions 8 has been used to model the existing filter lane from the A41 east to the A41 south.

- 6.26. ARCADY assessment results for the A41/Oxford Road junction (assuming that the existing junction layout were to remain unaltered) are shown in **Table 16**.

**Table 16. A41/Oxford Road ARCADY Results**

Approach Arm	AM				PM			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
<b>2013 Base Year</b>								
<b>A41 East</b>	0.69	7.34	0.39	A	1.15	9.76	0.54	A
<b>A41 South</b>	0.75	2.09	0.41	A	1.24	2.64	0.55	A
<b>Esso Services</b>	0.09	2.95	0.07	A	0.13	3.62	0.11	A
<b>Oxford Rd</b>	0.67	2.85	0.39	A	1.08	3.61	0.51	A
<b>2014 Opening Year + Committed</b>								
<b>A41 East</b>	0.79	9.45	0.42	A	0.97	10.08	0.49	B
<b>A41 South</b>	1.12	2.48	0.51	A	3.64	5.3	0.78	A
<b>Esso Services</b>	0.1	3.44	0.08	A	0.24	6.77	0.19	A
<b>Oxford Road</b>	1.37	4.28	0.57	A	1.95	5.82	0.66	A
<b>2014 Opening Year + Committed Development + Park &amp; Ride Site</b>								
<b>A41 East</b>	0.82	9.83	0.43	A	0.97	10.12	0.49	B
<b>A41 South</b>	1.12	2.49	0.51	A	3.99	5.69	0.8	A
<b>Esso Services</b>	0.1	3.44	0.08	A	0.25	7.21	0.2	A
<b>Oxford Road</b>	1.47	4.46	0.59	A	1.99	5.93	0.66	A
<b>2019 Future Year + Committed Development</b>								
<b>A41 East</b>	1.57	13.72	0.6	B	2.4	19.01	0.71	C
<b>A41 South</b>	1.74	3.29	0.61	A	18.19	20.68	0.95	C
<b>Esso Services</b>	0.14	4.48	0.11	A	0.86	22.63	0.46	C
<b>Oxford Road</b>	2.23	6.36	0.68	A	17.73	37.12	0.96	E
<b>2019 Future Year + Committed Development + Park &amp; Ride Site</b>								
<b>A41 East</b>	1.66	14.51	0.61	B	2.41	19.04	0.71	C
<b>A41 South</b>	1.75	3.29	0.62	A	24.82	26.42	0.97	D
<b>Esso Services</b>	0.14	4.49	0.11	A	1.04	27.44	0.51	D
<b>Oxford Road</b>	2.44	6.75	0.7	A	19.33	39.75	0.96	E

- 6.27. For the 2013 base model scenario, it is evident that the junction operates well within capacity during all time periods, with a maximum RFC of no greater than 0.55.

- 6.28. In the 2014 opening year with both the committed development and P&R traffic added to the junction it is still predicted to operate within capacity with the maximum RFC being 0.78.

- 6.29. However, for the 2019 future year + committed development scenario (no P&R) the existing junction is predicted to operate over capacity with an RFC and 0.95 and 0.96 predicted on the A41 south and Oxford Road arms respectively in the PM peak. When the P&R traffic is added to the network the RFC increases marginally which has a minor impact on queues. On the A41 south arm of the junction queues are predicted to increase by six PCUs while on the Oxford Road



arm they are predicted to increase by two PCUs. This demonstrates the minimal impact the proposed P&R is likely to have on this junction if the layout were to remain the same.

- 6.30. During the AM peak, the junction continues to operate within capacity for the 2019 future year with both committed development and the P&R development added to the network. The proposed P&R site would not have a material impact on the operation of this junction.
- 6.31. The full summary outputs are contained in **Appendix L**.

### Vendee Drive/B4030

- 6.32. The Vendee Drive / B4030 roundabout junction has been assessed using Junctions 8 (ARCADY module). Geometries for the model were taken from proposed design drawings issued as part of the South West Bicester Urban Extension TA and confirmed through onsite geometric measurements. The summary results for the Vendee Drive/B4030 junction are shown in **Table 17**.

**Table 17. Vendee Drive B4030 ARCADY Results**

Approach Arm	AM				PM			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
<b>2013 Base Year</b>								
<b>Middleton Stoney Road</b>	0.49	4.94	0.32	A	0.31	3.68	0.23	A
<b>Vendee Drive</b>	0.25	3.18	0.19	A	1.01	4.93	0.5	A
<b>B4030</b>	0.26	4.29	0.2	A	0.59	6.51	0.37	A
<b>A4095</b>	0.87	4.95	0.46	A	0.29	3.62	0.22	A
<b>2019 Future Year + Committed Development + Park &amp; Ride Site</b>								
<b>Middleton Stoney Road</b>	0.7	6.16	0.4	A	0.43	4.18	0.3	A
<b>Vendee Drive</b>	0.38	3.57	0.27	A	1.83	7.09	0.65	A
<b>B4030</b>	0.35	4.82	0.25	A	0.92	8.92	0.48	A
<b>A4095</b>	1.68	7.19	0.62	A	0.49	4.26	0.33	A

- 6.33. The 2013 base model scenario shows that the junction operates well within capacity, with a maximum RFC of 0.53 (seen on the A41 South approach in the Friday PM peak assessment) and average queues of no greater than 1.13 PCUs.
- 6.34. For the 2019 future year (including committed developments and the P&R site), the junction continues to operate well within capacity during all time periods. The maximum RFC is again observed on the A41 South approach during the Friday PM peak assessment with a value of 0.68 (still well within the capacity threshold of 0.85) whilst average queues are no greater than 2.12 PCUs. This clearly suggests that the junction will not experience any capacity issues as a result of increased traffic generated by committed developments as well as the proposed P&R site.
- 6.35. The full summary outputs are contained in **Appendix M**.

### M40 Junction 9 – Existing Situation

- 6.36. M40 junction 9 takes the form of a part signal controlled roundabout. The junction has been modelled using LinSig version 3. Table 18 presents a summary of the LinSig results for an AM and PM weekday peaks. The summary presents the Practical Reserve Capacities (%) and Total Delay in seconds per PCU (s/PCU) for the junction. A negative PRC means the junction is predicted to be operating over capacity. The full summary results contained in **Appendix N**.

**Table 18. M40 Junction 9 Existing Situation LinSig Summary**

Scenario	Peak Period	PRC (%)	Total Delay (s/PCU)
2013 Base	AM Peak	-62.0	310.78
	PM Peak	-96.7	347.17
2014 Opening Year + Committed	AM Peak	-160.5	705.19
	PM Peak	-214.8	710.23
2014 Opening Year + Committed + P&R	AM Peak	-160.5	712.18
	PM Peak	-216.7	719.35

6.37. **Table 18** shows that the existing junction is operating well beyond capacity in the base year of 2013. This matches on site observations. In the 2014 opening year the junction is pushed further over capacity with the introduction of committed developments and background growth. When the P&R site is added to the junction, a slight decrease in overall PRC and delay is predicted. In reality the P&R site is likely to have a very minor impact on the junction and on some arms actually result in a decrease in traffic. However, even assuming a worst case scenario the increases in the overall PRC and total delay is not significant.

6.38. The full summary outputs are contained in **Appendix N**.

### M40 Junction 9 – Proposed Scheme

6.39. Due to the existing highway capacity issues at M40 Junction 9 the HA have a scheme in place which proposes to improve the current operation of the junction. The proposed junction layout is presented in **Appendix G**. **Table 19** presents a summary of the LinSig results for an AM and PM peaks. The summary presents the PRC (%) and Total Delay in seconds per PCU (s/PCU) for the junction with the full summary results contained in **Appendix O**.

**Table 19. M40 Junction 9 Proposed Situation LinSig Summary**

Scenario	Peak Period	PRC (%)	Total Delay (s/PCU)
2019 Future Year + Committed	AM Peak	-26.4	272.25
	PM Peak	-12.2	130.30
2019 Future Year + Committed + P&R	AM Peak	-27.2	223.20
	PM Peak	-15.6	149.06

6.40. **Table 19** shows that the proposed HA scheme is likely to have a positive impact on the operation of the junction with overall delay and PRC decreasing compared to the existing situation even in a 2019 future year scenario. In the 2019 PM peak the development impact is predicted to be minimal resulting in a slight reduction in capacity. In the 2019 AM peak an increase in the PRC is predicted. Optimisation of the signal junction is likely to reduce the impact of the P&R site still further. As discussed previously in the report in reality the P&R site is likely to have a very minor impact on the junction and on some arms actually reduce traffic. However, even assuming a worst case scenario the increases in the overall PRC and total delay is are not considered significant.

6.41. The full summary outputs are contained in **Appendix O**.

### Proposed Oxford Road / A41 Scheme

6.42. The proposed Bicester Village scheme proposes major improvements for the A41 / Oxford Road junction. The proposed scheme is included in **Appendix G**. As this scheme is classed as committed it has been included within the assessment. It is understood in the opening year of 2014 the scheme will include the A41 / Oxford Road improvements along with the Tesco / Bicester Business Park proposed access junction off the A41. The Pingle Drive / Oxford Road improvements will not have been built out at this stage.

6.43. LinSig version 3 has been used to model the proposed linked signal junction. The existing South West Bicester Urban Extension signal junction and the proposed Tesco / Bicester Business Park signalled access junction have also been included within the model in recognition of their proximity to each other and the likely interaction between the junctions.

6.44. **Table 20** presents the results of the LinSig outputs for an AM and PM weekday peaks. Full summary results are contained in **Appendix P**.

**Table 20. Oxford Road / A41 Proposed Situation LinSig Summary**

Scenario	Peak Period	PRC (%)	Total Delay (s/PCU)
2014 Opening Year + Committed	AM Peak	-12.3	161.09
	PM Peak	-13.5	220.39
2014 Opening Year + Committed + P&R	AM Peak	-17.4	194.04
	PM Peak	-13.5	236.78

6.45. **Table 20** shows that the proposed highway scheme is likely to operate just above capacity in the AM and PM peak periods in the 2014 opening year without the P&R site being operational. With the proposed P&R open there would be a minimal change in the operation of the junction. However, this demonstrates a worst case scenario as the reduction in existing flows travelling into or out of Bicester has not been accounted for with the capacity assessment. However, this worst case shows there will be no significant change in capacity at this junction as a result of the P&R in the opening year.

6.46. In the 2019 future year it is expected that the proposed Oxford Road / Pingle Drive roundabout improvements would have been built out in line with the proposals which were part of the Bicester Village Phase 4 development. **Table 21** shows how the proposed scheme is predicted to operate in the 2019 future year with and without development. It should be noted that only PM peak traffic flows were made available for Pingle Drive / Oxford Road junction and as such only the PM peak results have been presented. Full summary results are contained in **Appendix P**.

**Table 21. Oxford Road / A41 Proposed Situation LinSig Summary**

Scenario	Peak Period	PRC (%)	Total Delay (s/PCU)
2019 Future Year + Committed	PM Peak	-23.5	684.28
2019 Future Year + Committed + P&R	PM Peak	-26.4	727.9

6.47. The results show that the junction is likely to operate over capacity in the 2019 future year without the P&R being operational. With the P&R site open the junction is predicted to operate with a slightly reduced capacity. However, this represents a worst case and even considering the increase in delay and PRC is not considered significant.

# 7. Sensitivity Test

## Technical Scope

- 7.1. It was agreed with OCC that two sensitivity tests will be carried out to assess the sensitivity of the local highway network in the future years. The following section presents the results of the two sensitivity tests.

### Sensitivity Test 1

- 7.2. In view of the proposed growth proposed in and around Bicester it was deemed prudent a future year scenario was assessed which included all developments within the current Local Plan. In order to do this OCC provided outputs from the recently updated Bicester SATURN Model. The future year modelling that was undertaken goes beyond 2031 as it includes all known / planned growth which includes:

- North West Bicester fully developed out
- Graven Hill
- SW Bicester phase 2
- Bicester Business Park
- Town centre redevelopment phase 2
- RAF Bicester
- Bicester Gateway
- North East Bicester Business Park
- South East Bicester

- 7.3. The modelling also includes the proposed highway improvements associated with Bicester Village.

- 7.4. Turning flows were provided for the 2012 base year and 2031 future year for the following junctions:

- A41 / Vendee Drive / Wendlebury Road - five arm site access junction.
- Vendee Drive / B4030 / Howes Lane (A4095) / Middleton Stoney Road - four arm roundabout junction
- A41 / Oxford Road / Petrol Filling Station - four arm roundabout junction
- Oxford Road / Pingle Drive – four arm roundabout junction
- M40 Junction 9 – four arm grade separated signalled roundabout junction.

- 7.5. The outputs provided by OCC are provided in **Appendix Q**.

- 7.6. Flows were also provided for the existing South West Bicester Urban Extension access onto the A41 and the proposed Tesco / Bicester Business Park site access junction. Inspection of these flows showed significant turning movements missing from the turning flow diagrams and as such were deemed inappropriate for use within the assessment. Therefore, the proposed model for the scheme has been adapted to only include the A41 / Oxford Road and Oxford Road / Pingle Drive proposed junction arrangements.

- 7.7. These turning flows have been directly inputted into the junction models. By doing this the sensitivity test takes account of any redistribution of traffic that is likely to occur as a result of the proposed growth in and around Bicester.

- 7.8. Assessments have therefore been undertaken for the following scenarios:

- 2031 Future Year
- 2031 Future Year + P&R.

## Vendee Drive / A41 / Site Access Junction

- 7.9. The flows from the 2031 Future Year + P&R scenario have been inputted into the same ARCADY model used to undertake the assessments in the previous chapter. The results of this assessment are presented in **Table 22** and the full outputs contained in **Appendix R**.

**Table 22. Vendee Drive / A41 / Site Access Junction Sensitivity Test 1**

Approach Arm	AM (07:30 – 08:30)				PM (17:00 – 18:00)			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
<b>2031 Future Year (Saturn Flows) + Park &amp; Ride Site</b>								
<b>Vendee Drive</b>	1.75	12.17	0.61	B	1.01	8.5	0.50	A
<b>A41 North</b>	1.31	3.04	0.55	A	1.01	2.6	0.50	A
<b>Wendlebury Rd</b>	0.93	6.24	0.47	A	0.2	3.57	0.17	A
<b>A41 South</b>	1.69	3.83	0.61	A	1.88	3.75	0.64	A
<b>P&amp;R Site Access</b>	0.01	4.97	0.01	A	0.15	5.87	0.13	A

- 7.10. Using flows from the Bicester SATURN model for a 2031 future year show that the junction is predicted to operate well within capacity in both the AM and PM peaks. Due to the strategic nature of the SATURN model it is able to account for re-distribution of traffic on the network and therefore provide an estimation of future year traffic flows taking account the substantial level of development proposed within the Bicester area.
- 7.11. This shows that the 2019 future year scenarios presented in Chapter 6 may be presenting an overly robust situation in terms of potential traffic flows at the site access junction.

## A41/Oxford Road

- 7.12. The flows from the 2031 Future Year + P&R scenario have been inputted into the same ARCADY model used to undertake the assessments in the previous chapter. The results of this assessment are presented in **Table 23** and the full outputs contained in **Appendix S**.

**Table 23. A41/Oxford Road ARCADY Results**

Approach Arm	AM				PM			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
<b>2031 Future Year (Saturn Flows)</b>								
<b>A41 East</b>	0.63	7.84	0.37	A	0.79	8.46	0.44	A
<b>A41 South</b>	3.22	4.82	0.75	A	1.91	3.34	0.65	A
<b>Esso Services</b>	0	0	0	A	0.00	0.00	0	A
<b>Oxford Rd</b>	14.43	31.70	0.94	D	2.64	7.83	0.72	A
<b>2031 Future Year (Saturn Flows) + Park &amp; Ride Site</b>								
<b>A41 East</b>	0.65	8.08	0.38	A	0.80	8.48	0.44	A
<b>A41 South</b>	3.23	4.83	0.75	A	2.05	3.50	0.66	A
<b>Esso Services</b>	0	0	0	A	0	0	0	A
<b>Oxford Rd</b>	20.45	41.32	0.96	E	2.73	8.07	0.73	A

- 7.13. **Table 23** shows that this junction is predicted to operate within capacity during the PM peak with the P&R traffic added to the network. During the AM peak the junction is predicted to operate marginally over capacity with an RFC of 0.96 predicted on Oxford Road. The introduction of the P&R only results in a minor increase in queues and delays. This shows an opposite situation to the assessment carried out in Chapter 6 as this predicted the junction would operate above capacity in the PM peak, rather than the AM peak.

## Vendee Drive / B4030 / A4095

- 7.14. The flows from the 2031 Future Year + P&R scenario have been inputted into the same ARCADY model used to undertake the assessments in the previous chapter. The results of this assessment are presented in **Table 24** and the full outputs contained in **Appendix T**.

**Table 24. Vendee Drive / B4030 / A4095 Results**

Approach Arm	AM				PM			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
<b>2031 Future Year (Saturn Flows) + Park &amp; Ride Site</b>								
<b>Middleton Stoney Road</b>	1.26	8.42	0.55	A	0.97	6.65	0.49	A
<b>Vendee Drive</b>	1.43	6.15	0.57	A	0.89	4.73	0.47	A
<b>B4030</b>	3.96	18.92	0.79	C	2.17	11.59	0.69	B
<b>A4095</b>	0.65	5.3	0.39	A	0.48	4.43	0.32	A

- 7.15. **Table 24** shows that even with the 2031 SATURN flows and the proposed P&R scheme will have a minimal impact on the operation of the junction. All arms of the junction are predicted to operate within capacity during the AM and PM peaks which accords with the assessments carried out in Chapter 6.

## M40 Junction 9 – Proposed Scheme

- 7.16. In a future year of 2031 the highway improvements proposed at the M40 Junction 9 are expected to be in place. The 2031 future year flows extracted from the Bicester SATURN model have been entered into the LinSig proposal. The results are presented in **Table 25** and the full outputs contained in **Appendix U**.

**Table 25. M40 Junction 9 Existing Situation LinSig Summary**

Scenario	Peak Period	PRC (%)	Total Delay (s/PCU)
2031 Future Year	AM Peak	-33.5	191.27
	PM Peak	-2.7	82.17
2031 Future Year + P&R	AM Peak	-34.2	199.43
	PM Peak	-2.7	88.28

- 7.17. Table 25 demonstrates that in the 2031 future year the junction is predicted to operate over capacity. A worst case assessment shows that the P&R site is likely to slightly increase total delays across the junction. However the increases would not be significant and the P&R scheme would not have a material impact on the operation of the junction.

## A41 / Oxford Road Proposed Scheme

- 7.18. The proposed signalisation of the A41 / Oxford Road junction has been modelled as part of this study. **Table 26** shows how this proposed junction is predicted to operate in the 2031 future year scheme with the proposed P&R development in place and the full outputs contained in **Appendix V**.

**Table 26. A41 / Oxford Road proposed Scheme**

Scenario	Peak Period	PRC (%)	Total Delay (s/PCU)
2031 Future Year	AM Peak	-32.4	446.59
	PM Peak	-15.8	216.19

Scenario	Peak Period	PRC (%)	Total Delay (s/PCU)
2031 Future Year + P&R	AM Peak	-32.4	456.91
	PM Peak	-15.8	216.40

7.19. **Table 26** demonstrates that in the 2031 future year the junction is predicted to operate over capacity. A worst case assessment shows that the P&R site is likely to slightly increase total delays across the junction. However the increases would not be significant and the P&R scheme would not have a material impact on the operation of the junction.

## Sensitivity Test 2

7.20. In order to assess the sensitivity of the proposed development traffic on the network and in particularly the site access junction, a test has been carried out to determine the impact of the development assuming that the P&R operates at maximum capacity and meets a maximum accumulation of 600 vehicles. The likely arrivals and departures generated by the site assuming a maximum accumulation were demonstrated in **Table 7** and **8** earlier in this report.

7.21. Assessments have therefore been undertaken for the Vendee Drive / A41 / Site Access junction for the following scenario:

- 2019 Future Year + Committed Development + Maximum Accumulation P&R.

7.22. The model has been carried out in line with the technical scope presented in Chapter 6. **Table 27** presents the results of this assessment for an AM and PM peak.

**Table 27. Vendee Drive / A41 / Site Access Junction Sensitivity Test 2**

Approach Arm	AM (07:30 – 08:30)				PM (17:00 – 18:00)			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
<b>2019 Future Year + Committed Development + Park &amp; Ride Site</b>								
<b>Vendee Drive</b>	1.75	11.58	0.63	B	1.26	14.2	0.56	B
<b>A41 North</b>	4.69	7.36	0.82	A	3.68	5.74	0.79	A
<b>Wendlebury Rd</b>	0.28	9.06	0.21	A	0.49	8.44	0.33	A
<b>A41 South</b>	2.84	4.77	0.72	A	9.03	12.1	0.90	B
<b>P&amp;R Site Access</b>	0.01	5.14	0.01	A	1.29	23.94	0.57	C

7.23. **Table 27** shows that the site access junction is predicted to operate within capacity during the AM peak. During the PM peak the majority of arms are predicted to operate within capacity with the exception of the A41 southern arm which is predicted to operate with an RFC of 0.90. However it is still predicted to operate a “relatively free flow” LOS and queues and delays were viewed to be minimal. The site access arm of the junction is predicted to operate within capacity however delays are expected to increase to 24 seconds per PCU.

7.24. This presents a robust worst case scenario in terms of traffic flows on the network as no account has been taken for redistributed trips. Even considering this the junction still operates with a minimum amount of queuing.

## 8. Transport Implementation Strategy

### Background

- 8.1. This chapter provides an Outline Sustainable Transport Strategy to support the proposed P&R site.
- 8.2. The existing P&R sites in Oxfordshire were primarily provided with the aim of reducing the volume of traffic approaching Oxford City Centre and also to provide environmental benefits in sensitive city centre streets. Over time, this principle has been extended more greatly throughout the County. Section 11.13 in the Oxfordshire Local Transport Plan states that *“there is an existing policy to develop remote P&R sites further from Oxford along the A34 (north) corridor towards Bicester....this concept has proved successful at some locations in Scotland where a well-located site adjacent to a high-frequency commercial bus corridor can provide a cost-effective transfer point from car to bus”*.

### Bicester P&R

- 8.3. The proposed Bicester P&R site will offer a high quality interchange facility between modes, increasing the options available to those wishing to commute into Oxford and Bicester. The P&R site will provide interchange between:
  - Car and bus;
  - Car share and bus;
  - Walking and bus; and
  - Cycling and bus.
- 8.4. The existing S5 service currently serves the Bicester Town Rail Station meaning the site also has potential to provide interchanges between rail and bus.

### Policy Environment

#### Bicester Area Transport Strategy

- 8.5. The Bicester Area Transport Strategy forms part of Oxfordshire County Council's third Local Transport Plan (LTP3) which runs from 2011 to 2030 and aims to deliver transport improvements to Bicester, aligning with the objectives for Eco Bicester. This will be achieved through:
  - Encouraging people to make fewer trips by car and replacing these with trips made by foot, bike or bus;
  - Promoting low emission vehicles as they become available;
  - Promoting sustainable travel with wider benefits such as healthy lifestyles and improved quality of life;
  - Reducing congestion around the town; and
  - Highway improvements for the main roads which vehicles are encouraged to use.

#### Eco Bicester – One Shared Vision (2010)

- 8.6. The Eco Bicester Vision underpins the Area Transport Strategy and aims to promote sustainable travel to work through the following:
  - Seek local jobs to reduce out commuting significantly;
  - Walking, cycling and public transport will be promoted through working with new and existing businesses to prepare and implement Travel Plans.



- 8.7. The Transport and Movement section within the Vision seeks to “*encourage walking and cycling as the first choice for travel within the town to improve health, reduce carbon emissions and improve the quality of the environment*”.
- 8.8. A commitment is made to:
- Promote walking, cycling and public transport within the town;
  - Give priority to walking, cycling and public transport where possible;
  - Provide high quality cycle parking and storage;
  - Provide improved bus service information; and
  - Encourage electric vehicles and supporting infrastructure.

## Objectives

### Introduction

- 8.9. This section of the Sustainable Transport Strategy seeks to set out the objectives of the Strategy which will promote access to the P&R site to be made by sustainable modes. The Strategy is centred on how to access the P&R by sustainable modes and how best to encourage increased use of sustainable transport.

### Objectives

- 8.10. An effective Sustainable Transport Strategy can deliver a significant impact upon travel patterns by users of the site, in favour of the use of sustainable transport modes.
- 8.11. The specific objectives for Bicester P&R's sustainable transport access strategy are:
- Objective One: Sustain Oxfordshire County Council's emphasis on promoting sustainable transport;
  - Objective Two: Increase the percentage of those walking to the site in line with new developments;
  - Objective Three: Increase the percentage of those cycling to the site; and
  - Objective Four: Increase the percentage of those who car share to the site.

### Targets

- 8.12. Targets are used to monitor whether the Strategy is meeting its objectives. These targets are 'SMART' in nature:
- **Specific**, to say precisely what is being achieved;
  - **Measurable** over the duration of the target;
  - **Appropriate** and linked the overall objectives of the local authority accessibility strategy;
  - **Realistic** in terms of the potential for being achieved; and
  - **Time bound** - the target must define a date by which it is expected to be achieved.
- 8.13. Modal share is the key target to monitor the proportions of journeys to the site by different travel modes and initial surveys will be carried out to determine the modal split in the first months after the site opens. These surveys will initially take place both 3 and 6 months post opening and be used to formulate targets to increase the sustainable modal split and decrease the levels of single occupancy car trips to the site.
- 8.14. Targets should be set to achieve the objectives which are set out above. The targets are often interrelated and will help in meeting several objectives. Targets could include:
- Increase in multiple occupancy car trips to the site;

- Increase in levels of walking to the site based on new developments in the surrounding area; and
- Increase in levels of cycling to the site.

8.15. Quantified mode share targets will be determined once further details are known about travel patterns to the site and will also be based on a benchmarking exercise of what the modal share is like at existing P&R sites in the local area.

8.16. Once the detailed targets have been set then a survey will be repeated on an annual basis to monitor performance against the mode share targets and ensure that any remedial action is taken if necessary.

8.17. Whilst increasing walking to the site in the short term might not be the most feasible option, with a significant planned residential development within an acceptable working distance means that the site will have a good potential for future increases in walking mode share.

## Strategy

### Introduction

8.18. This section of the Sustainable Transport Chapter sets out actions to maximise the access to the site by sustainable travel modes.

### Initiatives

8.19. This section proposes a range of initiatives which are considered to be effective in maximising sustainable access opportunities from the first day of opening and to assist in increasing sustainable mode share on a year on year basis. The initiatives are tailored to the operational and location characteristics of the site. The individual responsible for administering the strategy can then choose the most appropriate initiatives to implement to meet the targets which have been set.

### Walking and Cycling

8.20. Whilst a P&R site is traditionally focussed on providing a bus shuttle service with a car park to divert trips away from city centres, it is crucial to promote the facility for use by those who wish to use sustainable modes. Not only is the facility for those who travel by car but it will also open up opportunities for those who live within walking and cycling distance to access employment, goods and services.

8.21. Walking and cycling might not be appropriate for everybody, however a number of initiatives are recommended to encourage local people to use the P&R facility, therefore capitalising on the trips which local people might already be making. Initiatives to encourage walking and cycling to the site include:

- The development of the P&R site to be carried out in partnership with the local authority to deliver local highway improvements, such as improvements to the local footways and cycle routes in line with new development
- To actively promote and market walking and cycling as ways in which to access the P&R site when it first opens;
- To take part and promote national events such as Walk to Work week etc., where people who are using the P&R from the local vicinity are encouraged to walk to the site and then take advantage of the bus service;
- At the information points in the P&R facility a map could be displayed which highlights the best walking and cycling routes to the site; and
- Monitor the utilisation of the cycle and motorcycle spaces to establish whether additional provision might be required as the use of the site increases.

- 8.22. Aside from good pedestrian access with direct routes and high quality surfaces and facilities, Walk and Ride needs no special provision above those which should already be provided at a good P&R facility.
- 8.23. Cycle and Ride also encourage cycling levels in the local area it should be investigated whether the site might be able to be used as a Park and Cycle site for Bicester town centre. Users can leave their cycles securely at the site overnight and travel to and from the via cycle as opposed to bus. Firstly, this encourages cycling and secondly reduces the impact on local bus services.
- 8.24. Sixty cycle parking spaces will be provided which will be covered from the weather and under CCTV surveillance, designed for the long stay user. Should the surveys post opening show a high level of cycle use then Oxfordshire County Council should consider providing additional spaces as well as lockers for cyclists.

## Kiss and Ride

- 8.25. Oxfordshire County Council should consider the promotion of Kiss and Ride scheme at the Bicester P&R site. The promotion of such a scheme would increase patronage on the bus service, but also encourage multiple occupancy car trips to the site.
- 8.26. Kiss and Ride maximises use of both the bus service but also the parking facility. Kiss and ride can be supported through integrating facilities with the onsite design for example having drop off and pick up areas included in the site design close to bus boarding and alighting points. Although the proposed site layout does not provide a designated Kiss and Ride drop off point, this could be considered at a later date.

## Car Sharing

- 8.27. Park & Ride sites may act as a useful location to encourage car sharing trips. A dedicated P&R section could be set up within Oxfordshire County Council's car share scheme for people who wish to share car journeys from their start locations to the P&R site.
- 8.28. Dedicated onsite parking spaces could also be included for car sharers which are located nearest to the bus boarding and alighting points.
- 8.29. The opportunity to set up an informal Park and Share scheme could also be investigated where people could be encouraged to meet up with car sharing colleagues, drop off one or more unused cars and continue a journey to the shared destination. As these Park & Car Sharing users will typically have the lowest level of desire for facilities, dedicated parking should be provided in an area remote from bus stops or other waiting facilities, but still in a secure CCTV covered area.

## Public Transport

- 8.30. The benefits of using public transport should be conveyed to the residents in the local area to increase utilisation of the P&R service as well as other bus services to promote public transport as part of an overall strategy.
- 8.31. Providing information relating to bus travel will be an important factor in reducing single vehicle occupancy for journeys by staff. Providing public transport information is cheap and easy to implement, but can still be influential in changing travel behaviour patterns. OCC should seek to agree with the bus operator to ensure that real time passenger information is installed at the site. This will encourage people to use the site as they will be able to gain information about the next services quickly and easily.
- 8.32. Any promotion of the P&R facility should not be at the detriment to any existing bus services, rather it should be promoted as part of a package of measures.

- 8.33. Links to journey planning websites and Oxford's mobile phone application, as well as bus operator contact details should also be provided at information points on the site. This will allow individuals to plan onwards journeys by sustainable modes, further extending the impact of the sustainable travel chain.
- 8.34. Integrating the ticketing for the P&R service with other local services will encourage users of the P&R to continue to use public transport services at either end of their journey particularly rail from Bicester and / or Oxford. Oxfordshire County Council should liaise with the bus operators to ensure that this is an option for users of the Bicester P&R facility.

## Information and Marketing

- 8.35. Sustainable travel will be promoted through:
- Creating locality maps to show suitable routes for walking and cycling to the P&R facility;
  - Include information on sustainable travel through the online portal for the P&R site; and
  - Promoting awareness in the local media using press releases, websites and social media.
- 8.36. Charging strategies also need to be considered and promoted effectively. The charging strategy will influence users' decisions on access modes i.e. whether the charge is administered on the bus or for parking the car. An element of this is also integrated ticketing to make onward travel by sustainable modes a more attractive option for P&R users. Furthermore paying on the bus would make Park and Cycle more attractive option.
- 8.37. Variable message signs on the surrounding trunk road network could also be utilised to display messages encouraging people to use the P&R at Bicester.

## Electric Vehicle Charging Points

- 8.38. There are currently no plans for the provision of electric vehicle charging points at the site. As a network of electric vehicle charging points have already been installed across Oxford there is the opportunity to expand this provision at the proposed Bicester site. There are already charging points at Thornhill and Pear Tree P&R sites, with additional charging facilities available in Redbridge and Seacourt soon. In order to encourage the use of electric vehicles this option should be considered at the Bicester P&R site to offer this service to users of the P&R who own, or wish to own, electric vehicles.

## Monitoring and Review

- 8.39. It is recommended that the site has surveys at 3 and 6 months post opening and then on an annual basis thereafter. This will allow Oxfordshire County Council to determine levels of use at the site and also enable the sustainable mode share to be determined. From these surveys the work needed to do to increase sustainable mode share can be deduced.
- 8.40. In the first year of operation Oxfordshire County Council should consider whether it is appropriate to equip the site access and egress with automatic counters to monitor the use of the site in detail.
- 8.41. Oxfordshire County Council should seek to liaise with the bus operator to establish whether information can be gleaned from the ticketing data, most notably passenger numbers and the time of trips.

## Action Plan

### Introduction

8.42. This section provides the Action Plan for the Strategy which has been developed to detail the timescales for delivery of the measures and initiatives included within this Plan. The initiatives are focussed on the users of the P&R facility.

### Action Plan

Action	Responsibility	Monitoring Success	Timescale
Work in partnership with OCC to deliver local highway improvements	OCC/developers	Implementation of improvements	TBC
Promote a "Walk to Work Week"	OCC /national organisations	Increased number users walking to the site	May annually
Provide walking and cycling route maps at the P&R facility	OCC	Increased number users walking and cycling to the site	As necessary
Investigate the provision of electric charging points	OCC Infrastructure Development	Installation of charging points	As necessary
Continued marketing through social media	OCC Communications Team	Continued awareness of the P&R site	As necessary
Include P&R site on car share database	OCC in conjunction with car share provider	Registration of trips on the car share website	On opening of the site

## 9. Summary and Conclusions

### Summary

- 9.1. Atkins have been commissioned by Oxfordshire County Council (OCC) to provide a Transport Assessment (TA) and Outline Sustainable Transport Strategy to support the planning application for the proposed Park & Ride (P&R) site located off the A41 to the south of Bicester, Oxfordshire.
- 9.2. The site will consist of 580 parking spaces and 60 cycle storage spaces. Its primary purpose is to act as a P&R site providing direct access to Oxford and Bicester. The site will also be used as part of an overall traffic management plan for Bicester which aims to relieve congestion issues related to the existing Bicester Village development. No new dedicated bus services will serve the site, rather existing bus services will be re-routed into the development.
- 9.3. The site which is currently not developed benefits from excellent walking and cycle links to the surrounding area, many of which have recently been implemented as a result of the South West Bicester Urban Extension. High quality footway / cycleways are present along Vendee Drive and the A41 towards Bicester.
- 9.4. A review of the Personal Injury Accidents in the vicinity of the site was undertaken for the latest five year period available. The proposed P&R site is not expected to unduly increase accidents on the local highway network.
- 9.5. The proposed development will be accessed via the newly constructed A41 / Vendee Drive five arm roundabout junction. This roundabout has been constructed as part of South West Bicester Urban Extension. The fifth arm of the junction which is currently a stub arm will form access to the proposed P&R site. The P&R facility will consist of:
  - 580 car park spaces including 14 disabled spaces
  - Cycle storage area with capacity for 60 cycles
  - Bus Shelters with perched seating
  - Pedestrian walkways
  - Water Retention Pond
  - Areas of soft landscaping
- 9.6. The Bicester P&R Demand Study which was undertaken by Halcrow was used to determine the likely trip generation of the development. The peak periods for trips to and from the development is predicted to occur in the AM and PM peak weekday periods. In the AM peak 94 two-way trips are predicted and in the PM peak 99 two-way trips are predicted. The traffic was distributed to the network based on the origin and destination data contained within the Bicester Park and Ride Demand Study.
- 9.7. The Bicester P&R Demand Study predicts that 44% of traffic accessing the site will have a final destination of Bicester. Furthermore, 20% of all traffic having a final destination of Oxford is likely to originate from Bicester. This means that potentially up to 64% of the total traffic accessing the P&R is already on the local highway network either accessing Bicester or travelling out of Bicester towards Oxford.
- 9.8. The redistribution of these existing trips was taken into account in order to calculate the net impact on the highway network during the peak periods. The analysis showed that the development, although slightly increasing traffic flows in on the local network did actually provide some benefits in terms of reductions in traffic. These were mostly noted on the A34 and A41.
- 9.9. When assessing the impact the proposed site will have on the operation of the local highway network a robust approach was undertaken in that it was assumed all traffic arriving and departing the site was new to the network.

- 9.10. Committed development and TEMPro Growth were added to base traffic data in order to provide a 2014 opening year and 2019 future year traffic scenarios. The P&R development traffic was then added to determine the likely impact the proposed site would have on the network.
- 9.11. The proposed site access junction was predicted to operate within capacity in the 2014 opening year scenario with the development added to the network. In the PM peak during the 2019 future year scenario the junction is predicted to operate marginally over capacity with the A41 southern arm operating with an RFC of 0.90; however in terms of level of service it is still predicted to be relatively free flowing. Once the development is added to the junction there is an imperceptible change to queues and delays.
- 9.12. The Vendee Drive / A4095 junction was shown to be operating within capacity during all scenarios. This illustrated that the development will not have a detrimental impact on this junction.
- 9.13. The A41 / Oxford Road junction was predicted to operate over capacity in the future year of 2019 when committed development traffic was added to the network. Even when assuming all vehicles accessing the P&R site are new to the network the P&R site would not have a material impact on delay and queuing.
- 9.14. Both the proposed A41 / Oxford Road and M40 Junction 9 highway scheme were predicted to be operating over capacity in the opening and future year scenarios. However, overall the P&R would not have a material impact on delays or queues at the junctions even though it has assumed that all trips to the site were new to the network.
- 9.15. Two sensitivity tests were also undertaken which showed how the junctions were likely to operate within the future year of 2031. Flow data was taken from the Bicester SATURN model which took account of all future development allocated within the Local Plan. This included all committed developments and highway schemes as well as the potential reassignment of traffic on the local network.
- 9.16. The Vendee Drive / A41 / Site Access junction and the Vendee Drive / A4095 / B4030 junctions were predicted to be operating well within capacity during the 2031 future year scenario with the Park and Ride side operational. The other junctions assessed on the local network were predicted to operate above capacity both without and with the P&R scheme. The impact of the P&R site is not considered to have a material impact on these junctions.

## Conclusion

- 9.17. This TA has demonstrated that the proposed Park and Ride site is unlikely to have a significant detrimental impact on the local highway network. The site is well placed to offer a range of sustainable travel options and meets the policies and aims set out in the Cherwell Local Plan. It is therefore the recommendation of this TA that the proposed site is recommended for approval on highway grounds.