New Local Plan: Princes Risborough Town Plan

Wycombe District Council

Princes Risborough Town Plan Traffic Modelling

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12 April 2017

Princes Risborough Town Plan

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Contents

Executive Summary

Jacobs is framework consultant to the Transport for Buckinghamshire Alliance (TfB) between Ringway Jacobs and Buckinghamshire County Council (BCC), and through this were appointed by Wycombe District Council (WDC) to provide transport consultancy advice with regards to the expansion of Princes Risborough. The new Local Plan is being developed by WDC to allocate sites for housing that contribute to the districts objectively assessed needs, and employment land for business expansion on the Princes Estate. The purpose of this study is to understand the impact of the expansion of Princes Risborough on the operation of the road network in and around the town.

For the purposes of this study, suitable modelling tools have been developed using the best available data. BCC's Countywide Transport Model has been refined as part of a localised model calibration and validation exercise using traffic counts and journey time data within Princes Risborough.

Using the transport model, a number of forecast model scenarios have been developed to test the impact of the new Local Plan. The 2033 do minimum forecast model (which excludes the new Local Plan development and associated infrastructure) indicates 30% higher car traffic volumes in 2033 across the Buckinghamshire Districts, with notable increases in traffic on the A4010 through the centre of Princes Risborough and the B4009. As such, known congestion hotspots such as the A4010 New Road/ Duke Street/ Longwick Road/ A4010 Aylesbury Road roundabout, and the Grove Lane/ A4010 junction are forecast to experience further degradation in performance.

Two further 2033 forecast model scenarios were developed. The first includes the new Local Plan development, western relief road, and A4010 package and the second includes additional traffic management proposals for Askett and Mill Lane which emerged from engagement with the Princes Risborough Steering Group.

The modelling shows that the forecast traffic volumes from the planned growth in housing and jobs can be accommodated in this location so long as extra road capacity is provided in the form of a new relief road. The new relief road allows traffic to avoid the town centre and the modelling shows that there is a reduction in traffic using New Road in Princes Risborough Town Centre. A consequence of this is that there are increased traffic volumes on the section of relief road outside of the railway station and on Summerleys Road, south of the railway bridge.

Provision of alternative road capacity supports aspirations for a transformation of the urban realm in the town centre. The traffic management package for Mill Lane and Askett is also shown to be effective at reducing rat running in these areas, as is to be expected given it proposes severing a number of roads. However, it is observed that the model shows an increase in traffic on Longwick Road, and Church Lane and Bridge Street in Great Kimble. Consequently this reintroduces pressure on the Tesco roundabout, as well as attracting traffic to a road that is narrow, lacking footways and provides access to a primary school. This suggests that a wider, more nuanced package should be considered.

Whilst the traffic generated by the proposed development can be accommodated locally with the addition of the relief road, the north south journey times increase (compared with the do minimum) for traffic travelling through the Princes Risborough area due to the change in traffic route choice and traffic generated by the planned development. However, the north south journey times are quicker than those in an unplanned and unmitigated growth scenario. The wider traffic impact of the new Local Plan proposals in areas such as Chinnor and Thame is a maximum increase of 182 two-way car trips in the peak hours.

1. Introduction

1.1 Preamble

Jacobs is framework consultant to the Transport for Buckinghamshire Alliance (TfB) between Ringway Jacobs and Buckinghamshire County Council (BCC), and through this were appointed by Wycombe District Council (WDC) to provide transport consultancy advice with regards to the emerging new Local Plan.

1.2 Background and scope of study

The new Local Plan is being developed by WDC to allocate sites for housing that contribute to the district's objectively assessed needs, and employment land for business expansion on the Princes Estate.

For the purposes of this study, suitable transport modelling tools have been developed. Previous transport modelling for the Western Relief Road stage 1 Options Assessment Report ((OAR), February 2016) has been further developed to take account of updates to the Countywide Transport Model. This model was used to create a number of 2033 forecast year models. These models include the most up-to-date new Local Plan land use proposals (uncertainty logs for this study, and the previous OAR are included in Appendix A), a western relief road, and the A4010 traffic calming package developed by the Princes Risborough Steering Group.[1] An additional scenario has been considered which also includes the proposed traffic management package in and around Askett. The purpose of this study is to use these models to understand the impact of the new Local Plan on the operation of the road network in and around Princes Risborough.

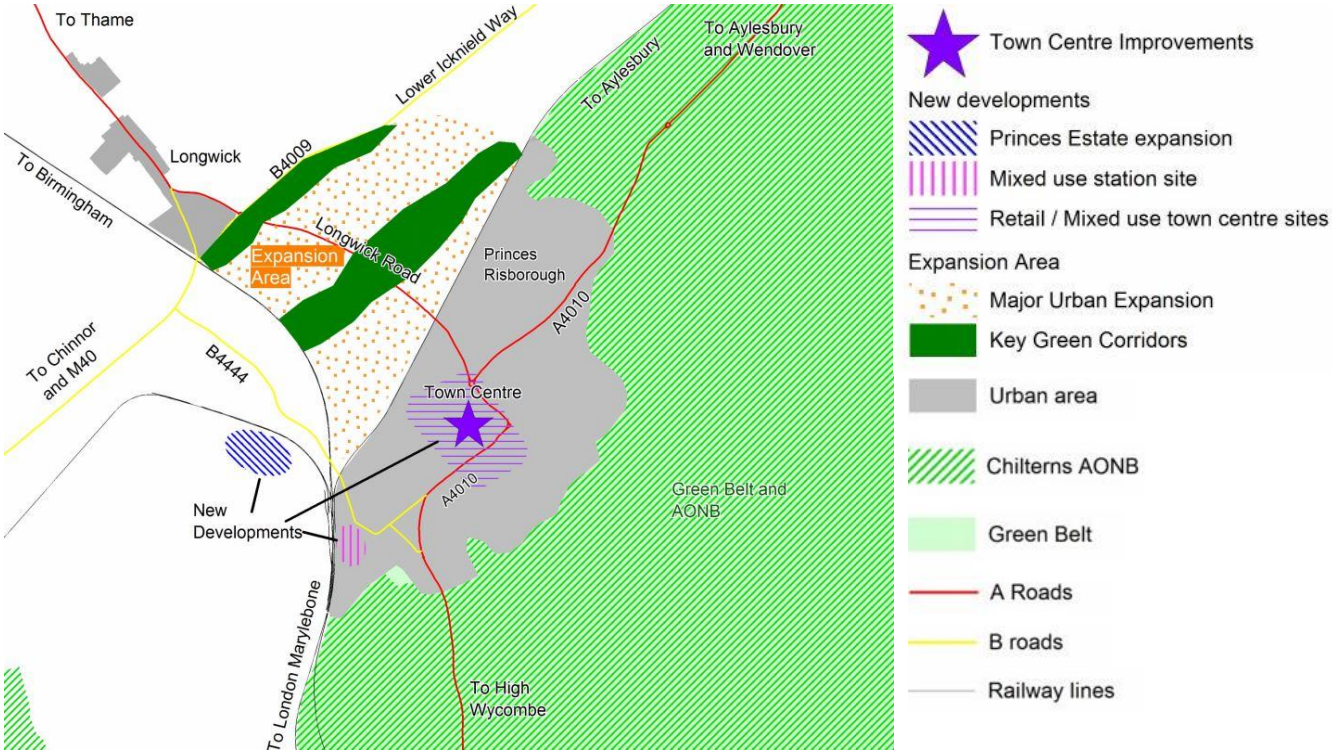


Figure 1.1: Context for the Princes Risborough expansion

[1] The Princes Risborough Steering Group is made up of members of the local community, business groups, town council, Wycombe District Council, and Buckinghamshire County Council.

1.3 Local issues and opportunities

There are local highway issues which have influenced the development of the scheme and wider transport package for the town. These are discussed in further detail in the OAR. A summary of the issues are highlighted in Figure 1.2 and include rat running traffic, higher frequency of personal injury accidents, junctions operating at or above capacity, and railway bridges restricting the movement of larger vehicles.

The A4010 is the primary north south route between Aylesbury and High Wycombe and passes through Princes Risborough. There are aspirations developed through engagement with the Princes Risborough Steering Group to reduce traffic volumes and speeds on the A4010, and introduce an urban realm transformation to the town centre which includes New Road and the two roundabouts in the town centre. WDC presented the wider town transport measures at a public exhibition on 25th and 27th February 2016. This package has been included in the modelling[2].

The Princes Risborough Steering Group includes people from local council, businesses, and residents of Princes Risborough and the surrounding area. WDC has met regularly with the Princes Risborough Steering Group throughout the development of the new Local Plan.

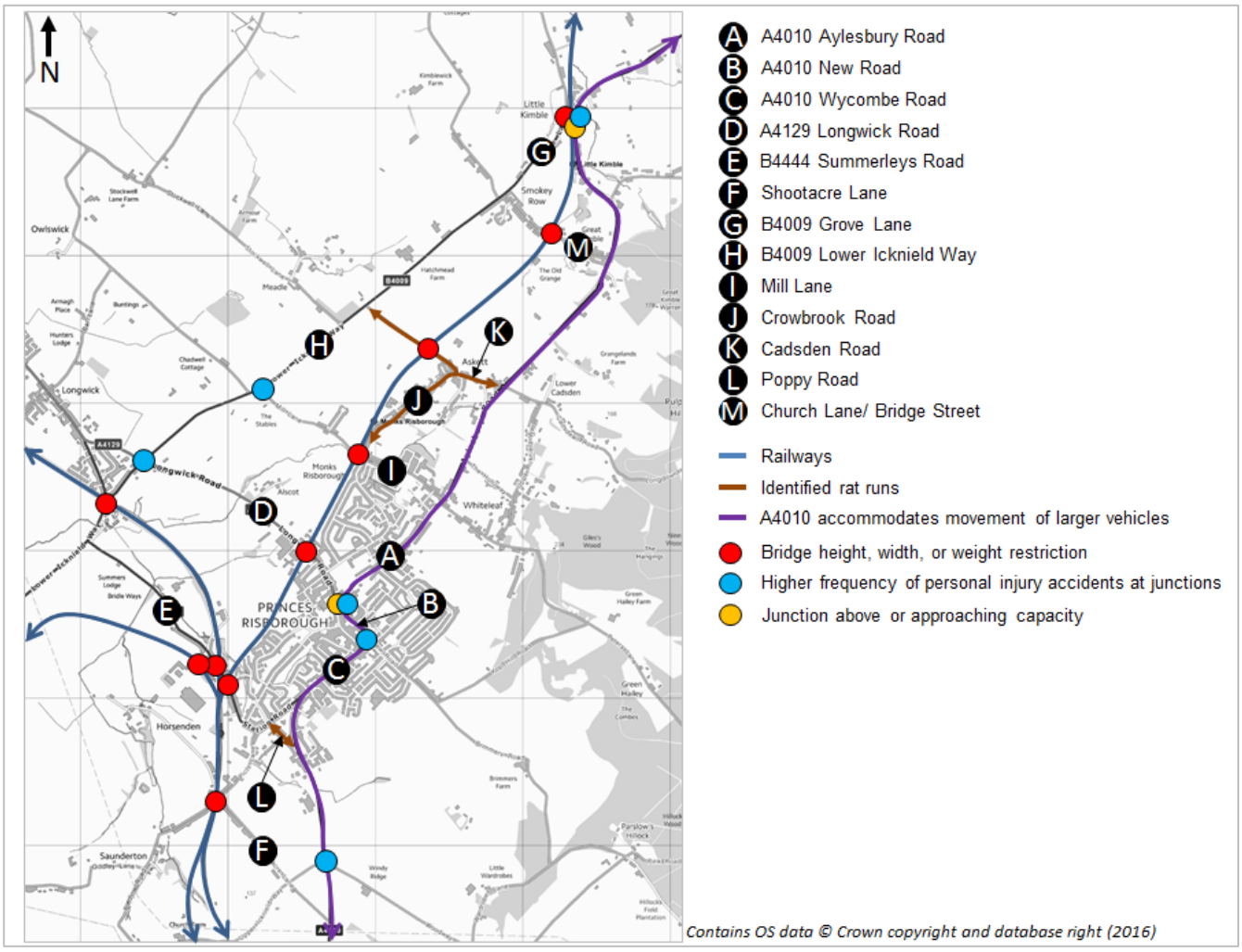


Figure 1.2: Princes Risborough local issues and options

[2] https://www.wycombe.gov.uk/uploads/public/documents/Planning/Princes-Risborough-Town-Plan/Prince-Risborough-plan-exhibition-transport-measures.pdf

2. Base year modelling methodology

2.1 Model development

The modelling platform used for the assessment is the existing BCC Buckinghamshire Countywide Model, which has a 2013 base year. The model has been developed using the PTV software package VISUM. In order to further develop the assessment of traffic conditions in Princes Risborough commensurate with the purposes of the study, the base model has been subject to network updates, reassignment, and re-validation. The model has also been updated to account for recent further enhancement of the Countywide Model. The model and modelling process is aligned with WebTAG principles and National Planning Practice Guidance (NPPG).

2.1.1 Network coding updates

As part of this phase of new Local Plan modelling a review of the network in and around Princes Risborough was undertaken and updates made to the network coding in the Countywide Model where appropriate to support the refined calibration and validation of the model. The extent of the network coding review is shown in Figure 2.1.

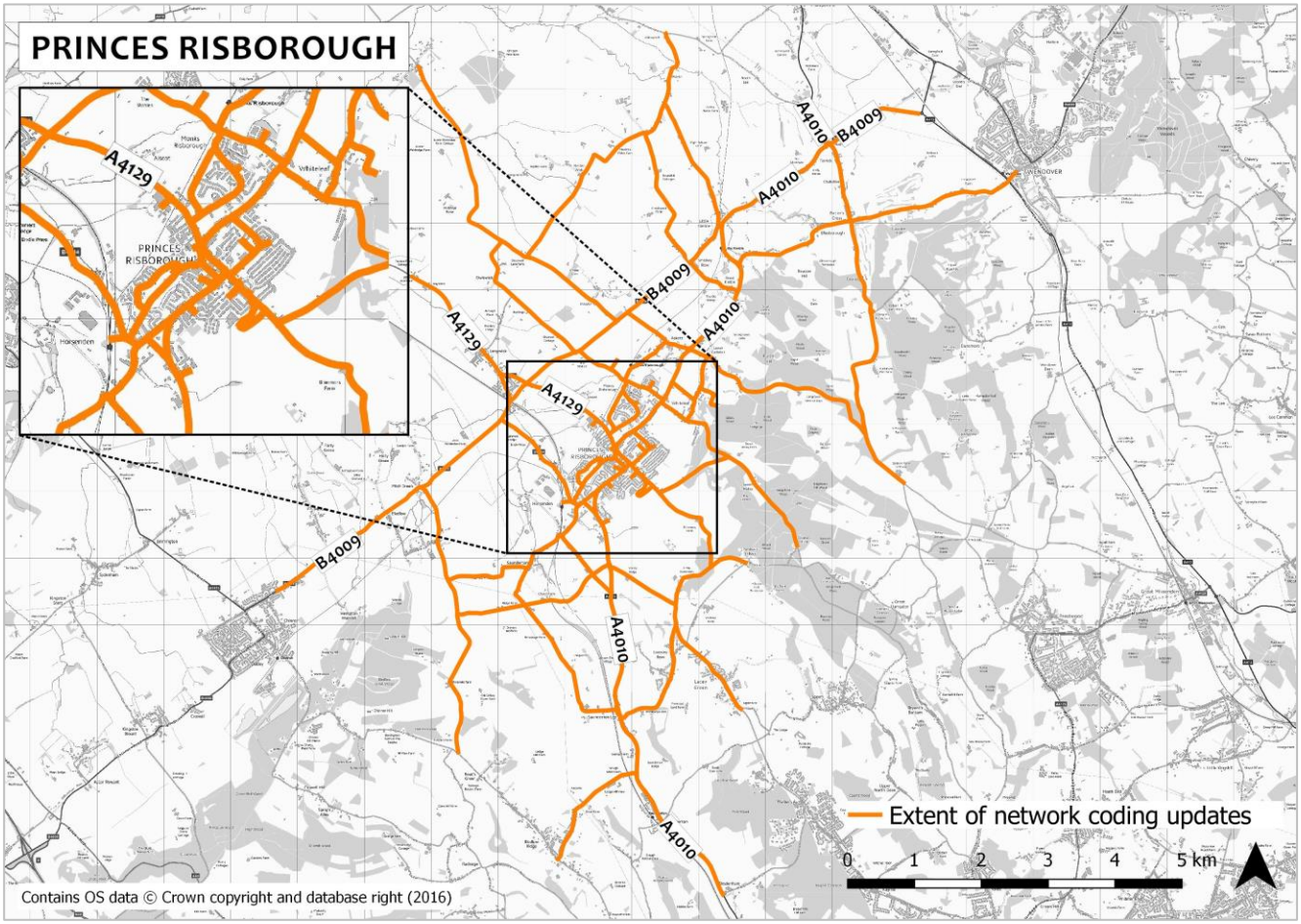


Figure 2.1: Extent of network coding updates

2.2 Calibration and validation

The calibration and validation of the base model is a process whereby the model is checked against observed data to assess how accurate it is in relation to existing traffic. The better a base year model reflects existing traffic, the more confidence users can be in the results from the model's forecasts.

WebTAG sets out the various criteria that central government expects to be met, for studies that require approval for central funding, before a transport model can be said to represent base year conditions to an acceptable standard. The approach adopted here is accepted practice where broad regional, county or district models are being developed, which focus on strategic, high-level impact assessment, and is in accordance with NPPG which states that:

"An assessment should adopt the principles of WebTAG by assessing the potential impacts of development within the framework of WebTAG objectives. For most Local Plan assessments the full methodology recommended will not be appropriate."

The satisfaction of NPPG guidance is set out in Table 2.1. This demonstrates that modelling is aligned with guidance, and is commensurate with the current stage in the local plan process.

NPPG	Description	Guidance Satisfied
Transport data overview	Should be: • Valid for intended purpose. • Reflect typical flow conditions. • Make appropriate use of local traffic forecasts (TEMPro or similar). • Accurately account for trip generation resulting from all land allocations. • Allow a comparative analysis of a with development scenario against a without development scenario.	Yes. The adopted modelling methodology has considered and included all of the recommendations appropriate for this phase of modelling work.
Calibration and validation	Should include: • Recent counts for peak period turning movements. • 12 hour / 24-hour automatic traffic counts Could include if appropriate: • Journey time surveys.	Yes. 2013 traffic count and journey time data have been used for the calibration and validation of the base year model.
WebTAG	An assessment should adopt the principles of WebTAG.	Yes. WebTAG principles have been followed in of the assessment including base year model validation and the generation of forecast scenarios.

Table 2.1: NPPG guidance on transport evidence bases

A localised calibration and validation exercise using traffic counts and journey times within the Princes Risborough area ensured that the new Local Plan base models are suitable for this study.

The acceptability guideline for a link flow validation in WebTAG is that 85% of the traffic flows must meet the requirements set out in Table 2 of WebTAG Unit M3.1. Comparison against 60 link counts in the local network showed that the 2013 base models met WebTAG requirements with validation in 85% and 93% of cases in the AM and PM peak hour models respectively.

The key route of concern in the model area is the A4010, so journey time validation focused on this and specifically the section between the Grove Lane/ A4010 junction and the Shootacre Lane/ A4010 junction. The acceptability guideline for journey time validation is that modelled times along routes should be within 15% of

surveyed times. A comparison between the AM and PM north and south bound observed and modelled journey times is shown in Table 2.2. This demonstrates that the base model meets the WebTAG Unit M3.1 requirements for journey time validation.

Direction	AM peak (8am to 9am)			PM peak (5pm to 6pm)		
	Observed journey time	Modelled journey time	% Difference	Observed journey time	Modelled journey time	% Difference
Northbound	523 seconds	521 seconds	0.4%	574 seconds	583 seconds	1.5%
Southbound	542 seconds	539 seconds	0.6%	497 seconds	495 seconds	0.4%

Table 2.2: Journey time validation for the A4010 between Grove Lane and Shootacre Lane

3. Development and network scenarios

3.1 Overview

This section sets out the various land use scenarios and assumptions used to produce the future year models. For each development scenario, forecasts of housing and employment growth have been added to the existing base land use information to generate a new development quantum for the forecast models.

3.2 Development summary (scenarios)

A number of development scenarios have been produced with a forecast year of 2033, which include increasing amounts of housing and employment growth in line with local plan proposals across the county. The do minimum and do something development scenarios (as required in WebTAG) were defined by WDC. Do minimum models include background traffic and development growth. Do something models are the do minimum plus the development and infrastructure that is proposed in the new Local Plan. Table 3.1 provides a summary of the differences in development and transport infrastructure in each scenario.

Future scenario (2033)	Summary details

Do minimum (DM)	• Growth capped to NTEM levels outside of Buckinghamshire.
	• Includes projected planning completions from 2013 to 2033 (2036 for Chiltern and South Bucks).
	• Includes outstanding housing and employment commitments within the districts.
	• Local to Princes Risborough includes the following developments:
	  • Former Whiteleaf, Picts Lane
	  • Ker Maria Nursing Home
	  • Leo Laboratories
	  • Former HCA land at Regent Park
	  • Land off Boxer Road

Do something 1 (DS1)	• As do minimum plus the Princes Risborough area developments: • New western road infrastructure to facilitate the emerging development. • Town centre/ A4010 package.
Do something 2 (DS2)	• As DS1 plus the following: • Traffic management package for Askett and Mill Lane (further detail is included in Section 3.4.2).
Do something 3 (DS3)	• As DS1 plus the following: • A new site on the B4009 north of Lower Icknield Way for relocation of town businesses.

Table 3.1: Modelled scenarios

3.3 Do minimum

The starting point for the do minimum development growth in Aylesbury Vale and Wycombe is based on the existing housing and employment commitment data provided by the districts, which totals an additional 11,596 houses and 30,277 jobs. In addition to this WDC requested that the additional developments listed in Table 3.2 were included in the do minimum modelling.

Development growth in Chiltern and South Bucks amounts to an additional 2,575 houses and 1,619 jobs and includes 2013 to 2015 (up to 1.04.15) completion data and sites with planning permission post 2015. For all areas outside of Buckinghamshire, growth in employment and housing is consistent with NTEM 6.2 levels of growth. Table 3.2 provides a summary of the do minimum development scenario.

Location	Totals
Aylesbury Vale District	9,416 houses and 24,265 jobs
Chiltern District	1,278 houses
South Bucks District	1,297 houses and 1,619 jobs
Wycombe District	2,180 houses and 6,011 jobs plus the following: • Former Whiteleaf, Picts Lane : 60 houses and 24 flats. • Ker Maria Nursing Home: 70 dwelling car home and 20 jobs • Leo Laboratories: 81 houses and 15 flats • Former HCA land at Regent Park: 7,900 sqm of B1/B2/B8 • Land off Boxer Road: 160 dwellings
Outside of Buckinghamshire	Capped to National Trip End Model (NTEM 6.2) growth

Table 3.2: Do minimum growth

There are also transport infrastructure changes that were incorporated into both the do minimum and do something models. These are summarised in Table 3.3 and the inclusion of these schemes is consistent with the strategic Countywide Modelling.

Scheme	District	Description
HS2: Chalfont Lane Widening	Chiltern	Widening of Chalfont Lane to increase link capacity
HS2: Realignment of B485 Chesham Road and Kings Lane	Chiltern	Existing road realigned with upgraded junction
A355 Relief Road	South Bucks	New link between the Pyebush Roundabout and A355 north of Beaconsfield
M4 Smart Motorway	South Bucks	J3 to 8/9 upgraded to a smart motorway
Western Rail link to Heathrow	South Bucks	Closure of Hollow Hill Lane
HS2: SM bypass	Aylesbury	New bypass off A4010
Stocklake Urban Link	Aylesbury	Upgrade to existing Stocklake Road
SLR and ELR (N)	Aylesbury	New link road connection Stocklake with A418
HS2: Realignment of A41 Bicester Road	Aylesbury	New junction and realignment of existing A41
HS2: Realignment of Station Road	Aylesbury	Station Road and surrounding roads realigned
HS2: Realignment of Perry Hill	Aylesbury	Realignment of existing road
Town Centre Masterplan	Wycombe	Capacity reduction on A40 with new link roads and capacity increases elsewhere
Southern Quadrant	Wycombe	Upgrade to Cressex Road / Cressex link junction and John Hall Way
Coates Lane	Wycombe	New road link from Morrison's to Coates Lane
Chapel Lane Junction	Wycombe	Junction improvements

Table 3.3: Network changes in the do minimum and do something scenarios

3.4 Do something

3.4.1 Do something 1

This assessment focuses on the Princes Risborough area. Both DS1 and DS2 consider the development proposed as part of the new Local Plan, including:

- Princes Risborough expansion area:
  - 2,500 homes
  - 1,000 sqm business in a local centre (B1C)
  - 2FE (480 pupils) and 1FE (240 pupils) primary schools
- Princes Estate expansion:
  - 12,000 sqm business to accommodate relocated businesses
  - 10,000 sqm new business use (B1C)
- 60 new homes at land off Poppy Road.
- Princes Risborough Secondary School expanded from 6FE to 8FE.

The number of car trips that are generated by the new Local Plan development is based on trip rates derived from the TRICS database. The origins and destinations of the car trips generated uses assumptions taken from similar land use zones within the model. Retail and community (e.g community centre) uses in the Princes Risborough expansion area are assumed to not generate significant traffic volumes in the AM and PM peak hours and/ or trips to these uses are assumed to be part of an internal, linked, or pass by trip.

The development is considered to be dependent upon the provision of a western road which facilitates growth in Princes Risborough, and allows north-south journeys to be made via an alternative to the A4010. The preliminary alignment of this road infrastructure is shown in Figure 3.1. This has evolved and is a hybrid of options 11a, 11b, 15a and 15b, considered previously as part of the OAR.

The Station Road/ Summerleys Road junction is modelled as being traffic signal controlled. A number of measures that emerged from engagement with the Princes Risborough Steering Group are shown in Figure 3.2. These include measures that could potentially be provided to reduce traffic speeds on the current A4010 and to introduce a weight restriction of 3.5 tonnes on some sections of this road. Clearly this weight restriction is only achievable with a new road in place which is fit for all classes of traffic.

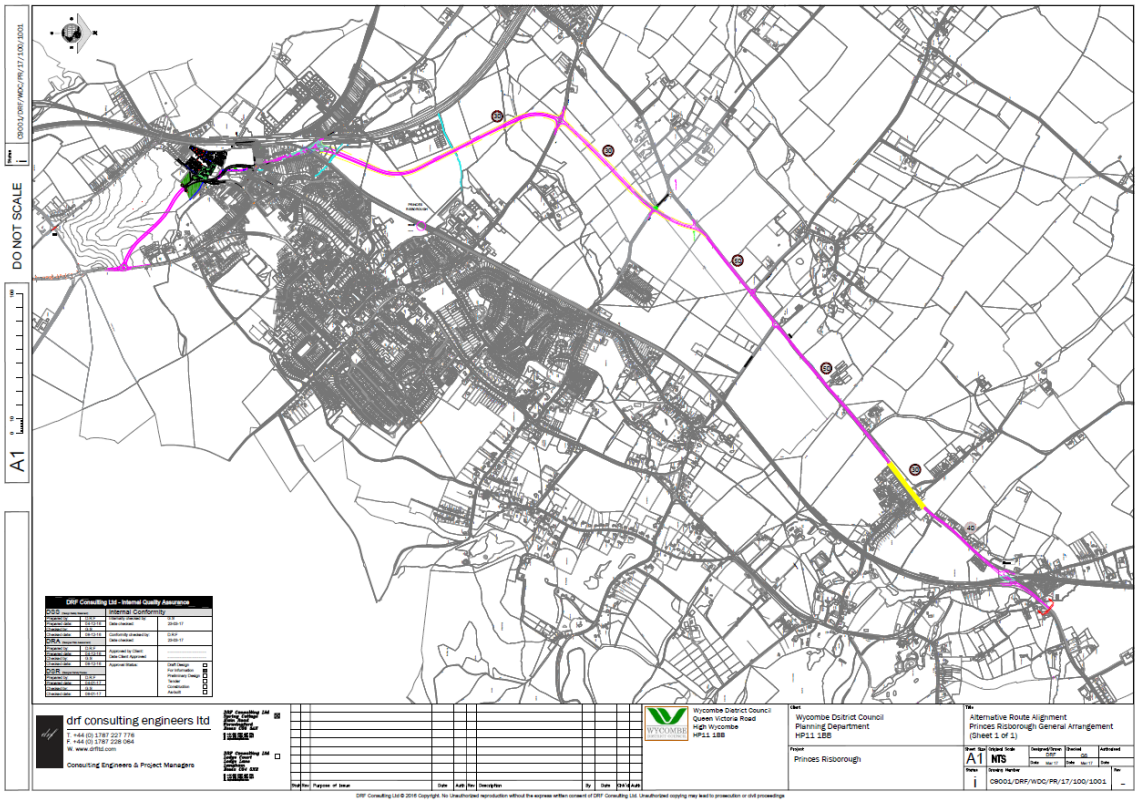


Figure 3.1: Western road at Princes Risborough

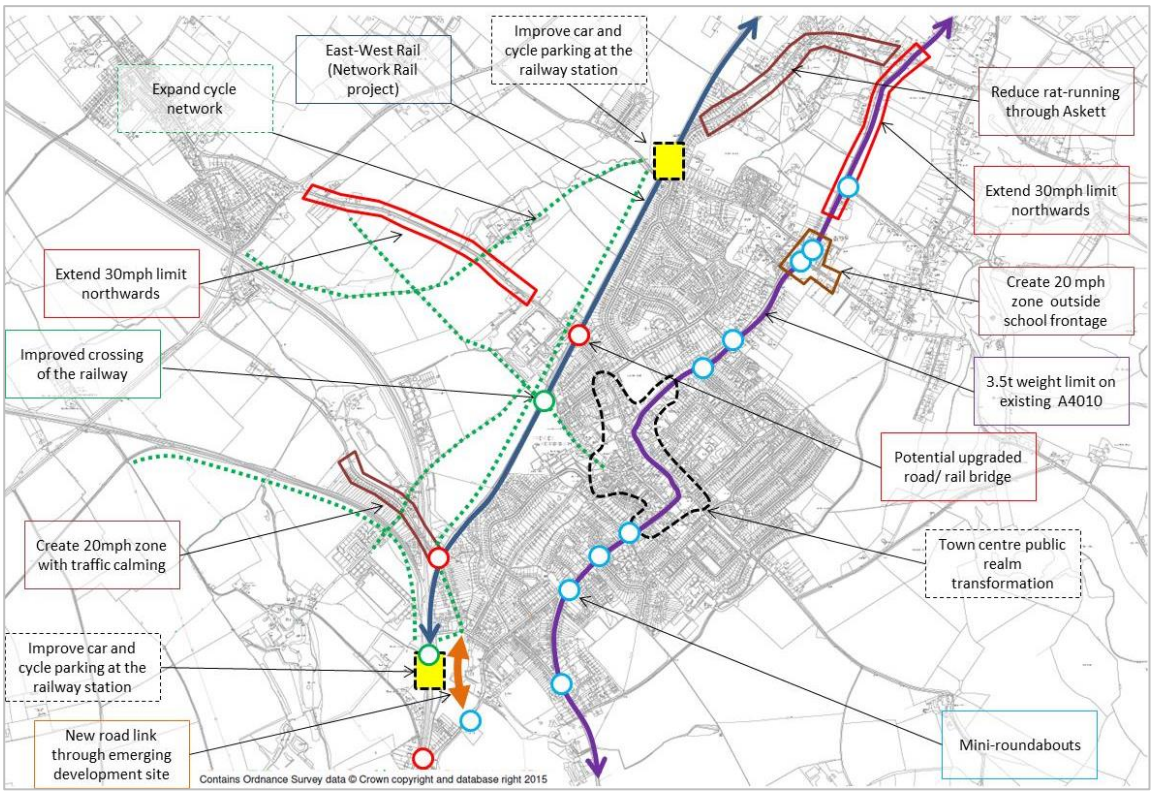


Figure 3.2: A4010 and other traffic management measures at Princes Risborough

3.4.2 Do something 2

In addition to the development and infrastructure included in DS1, a further scheme emerged from engagement with a sub group of the Princes Risborough Steering Group. A package for reducing rat running traffic on Mill Lane, Askett Lane and Crowbrook Road has been considered. The interventions proposed are shown in Figure 3.3 and include:

- Stopping up of Mill Lane, Askett Lane, and Crowbrook Road.
- Traffic calming of Mill Lane.
- Single estate road between Mill Lane and the relief road which adopts Manual for Streets principles, and designed to facilitate local traffic movements, whilst being unattractive to through traffic. This was modelled as a 20mph road, low capacity, and 1.5km in length,

Figure 3.3: Road closures and traffic calming in DS2

3.4.3 Do something 3

In addition to the development and infrastructure included in DS1, a further potential development site, as shown in Figure 3.4, for an alternative relocation of town businesses emerged from discussion with WDC. The following changes to the land use were made in the DS3 scenario:

- B4009 Land North of Lower Icknield Way
  - 10,000 sqm business
- Princes Estate expansion:
  - 12,000 sqm business

- 10,000 sqm new business use (B1C)

The trip rates and distribution for the sites was determined by the same methodology as in the DS1 scenario. All other land uses were assumed to be the same. The infrastructure in the DS3 scenario was assumed to be the same as in the DS1 scenario, with the addition of site access for the new site north of Lower Icknield Way.

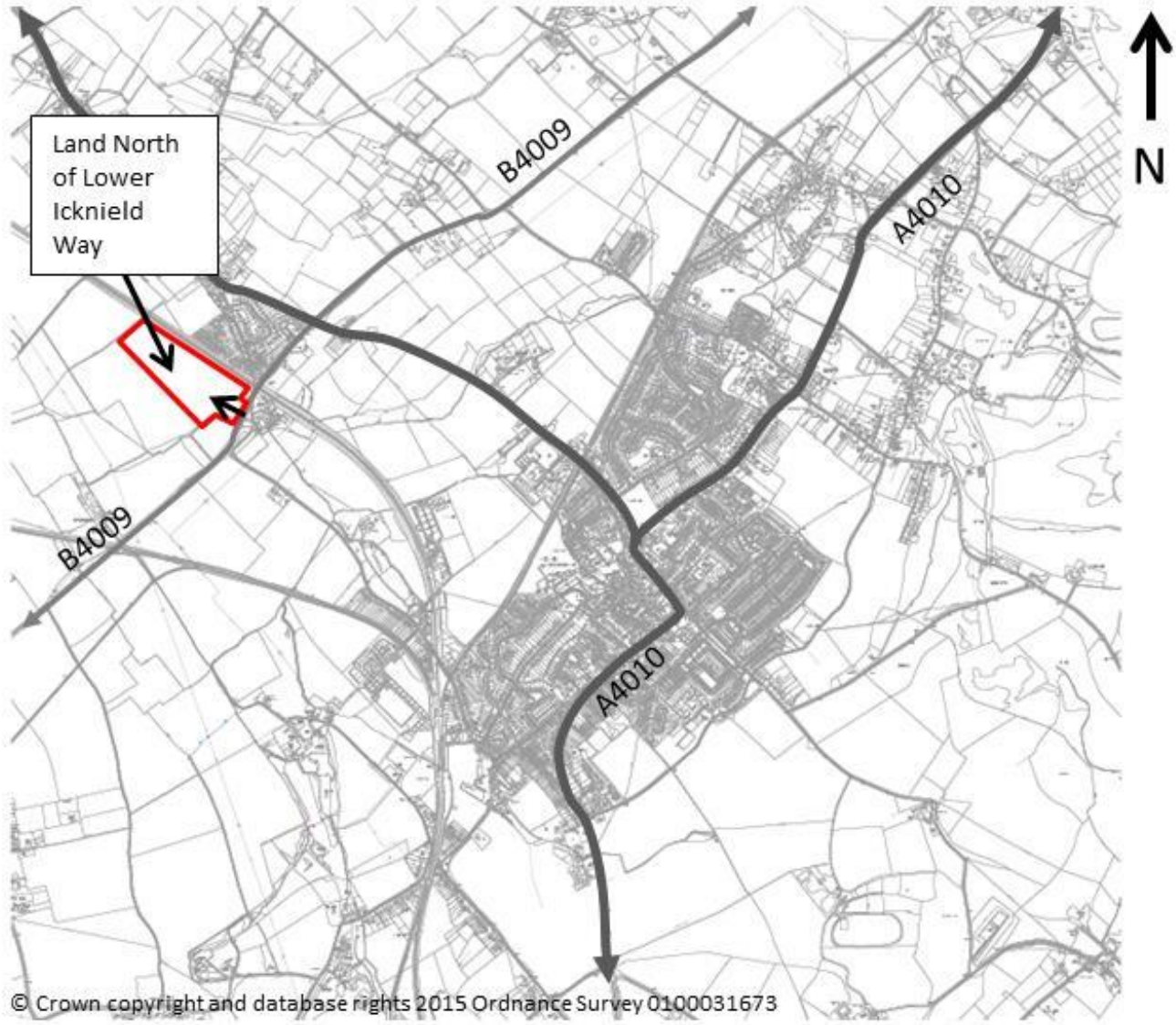


Figure 3.4: Location of land north of Lower Icknield Way

4. Modelling results

4.1 Overview

This chapter presents the results from the 2033 do minimum and do something models. The analysis focuses on traffic volumes, congestion and journey times.

4.2 Traffic volumes

The traffic volumes are considered for the 2033 do minimum and do something scenarios. This analysis is based on the demand flow in order to highlight the differences between the scenarios. Demand flow is the hourly demand volume (in vehicles) travelling on a link and is distinct from the actual flow. The actual flow is the link volume after capacity constraints have been applied. Demand flow is considered more useful for assessing the impacts in the model because it reflects the level of traffic volume that should be planned for in terms of infrastructure provision.

The 2033 do minimum traffic flows are shown in Figure 4.1 and the flow differences between 2033 do minimum and 2013 base are shown in Figure 4.2. This highlights that higher traffic volumes in 2033 in this area are forecast in particular on the A4010 and B4009. This illustrates that traffic volumes in Princes Risborough are forecast to increase regardless of whether the emerging new Local Plan development eventuates.

The 2033 do something traffic flows are shown in Figures 4.3, 4.4 and 4.5 for the DS1, DS2 and DS3 scenarios respectively. Comparison with the traffic flows shown in Figure 4.1 illustrates that there has been a reduction in flow on the A4010 in all the do something scenarios.[3] The DS2 plots also show that there has been a reduction in traffic on Mill Lane and Cadsden Road, following the introduction of these additional road network changes.

Table 4.1 provides a summary of the do minimum, DS1, DS2 and DS3 traffic flows on particular roads in and around Princes Risborough.

Road/ Location	2033 DM (vehicles)		2033 DS1 (vehicles)		2033 DS2 (vehicles)		2033 DS3 (vehicles)	
	AM	PM	AM	PM	AM	PM	AM	PM
A4010 New Road	1702	2026	744	700	876	803	753	702
Poppy Road	238	109	234	142	222	134	239	154
Shootacre Lane	62	9	4	5	4	5	4	5
Longwick Road (north of railway)	722	784	970	954	1223	1112	1003	954
Mill Lane (south of railway)	221	198	330	243	193	165	279	245
Cadsden Road (in Askett)	550	536	697	689	0	0	702	689
Lower Icknield Way	1326	1388	1999	2176	1934	2076	1996	2176

Table 4.1: 2033 do minimum, DS1, DS2 and DS3 demand traffic flows (two-way)

It is noted that in reality the traffic flow on Cadsden Road would be greater than the zero reported by the DS2 model because there would still be provision for local access. The zero traffic volume reported in Askett is due to the locations of where zones in the strategic model are joined to the road network. Regardless of this, the results demonstrate the package would reduce the traffic volumes through Askett and on Mill Lane. However, traffic does reroute to Longwick Road and Church Lane/ Bridge Street in Great Kimble, demonstrating that further work is required on the development of the traffic management package.

[3] The changes to the network coding in the do something models means that it is not possible to produce a flow difference plot for do something vs do minimum.

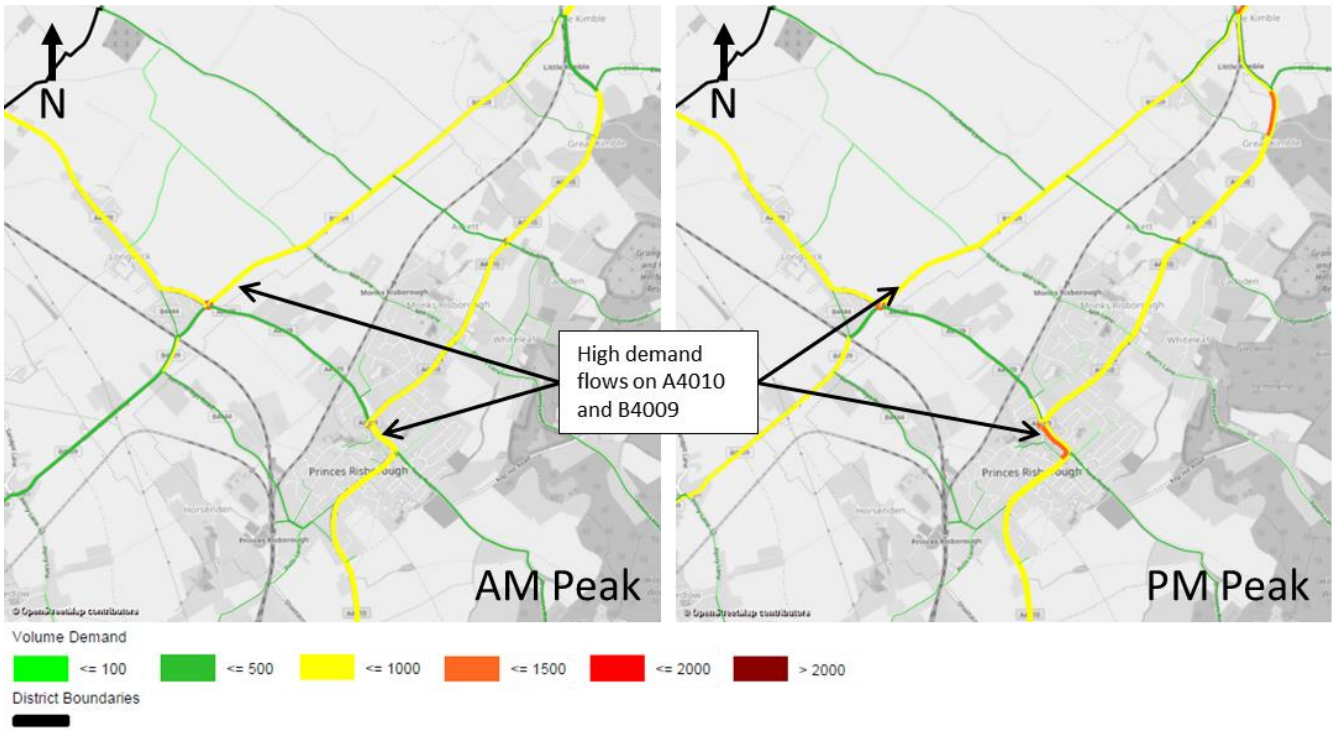


Figure 4.1: 2033 Do minimum traffic demand flows during the AM and PM peak hours

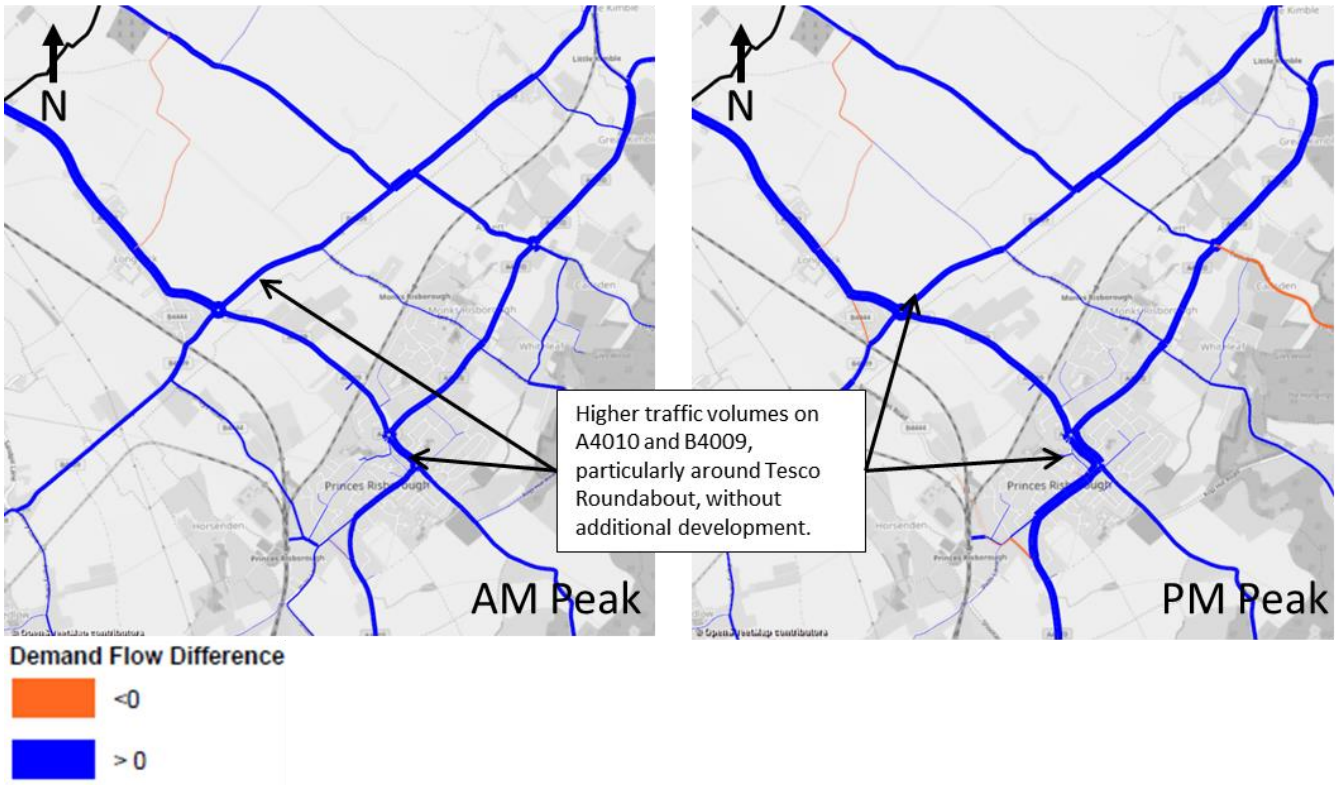


Figure 4.2: Flow difference plots (2033 do minimum vs 2013 base) during the AM and PM peak hours

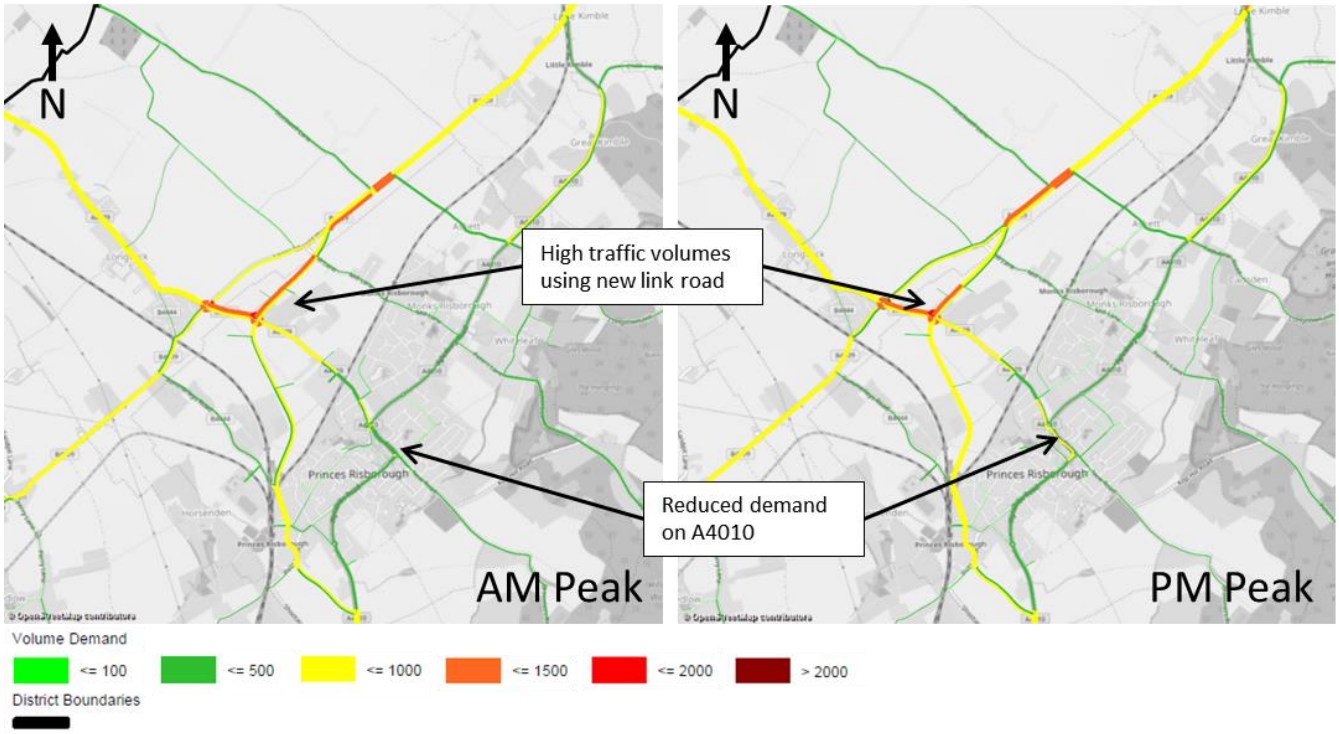


Figure 4.3: 2033 DS1 traffic demand flows during the AM and PM peak hours

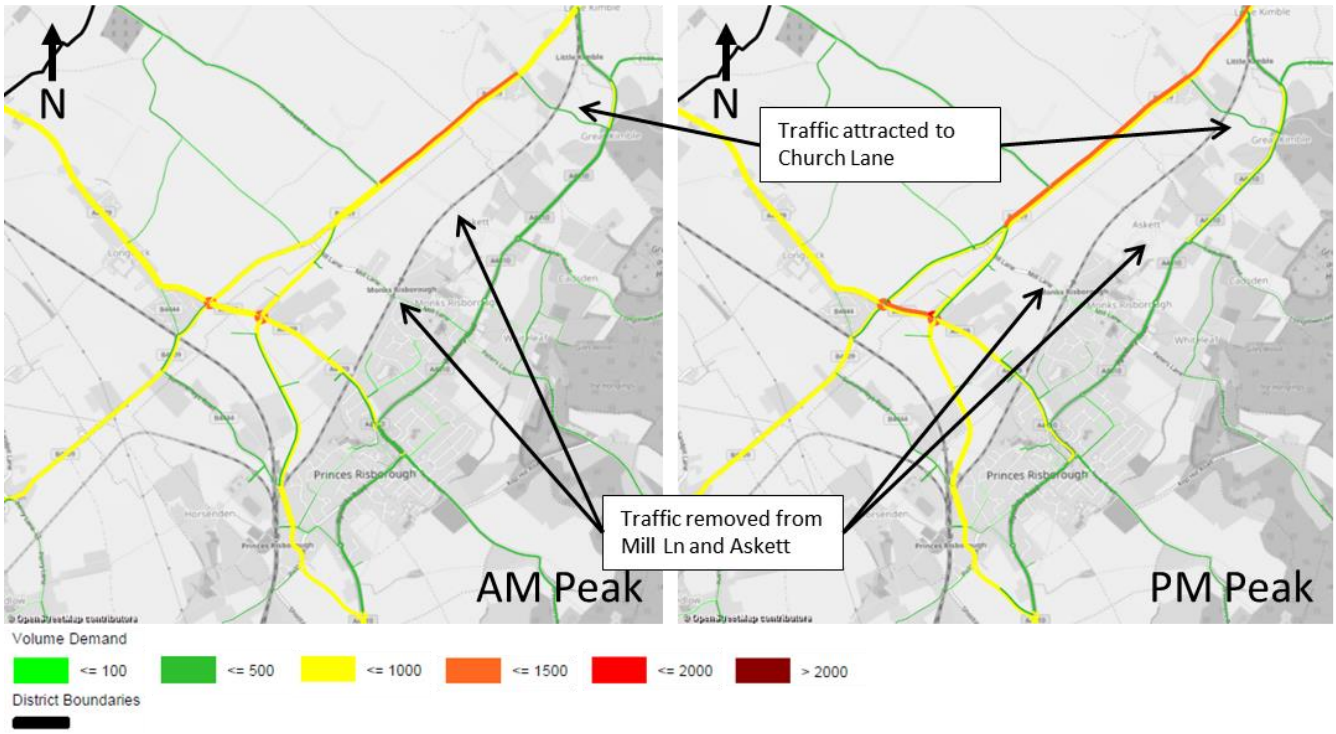


Figure 4.4: 2033 DS2 traffic demand flows during the AM and PM peak hours

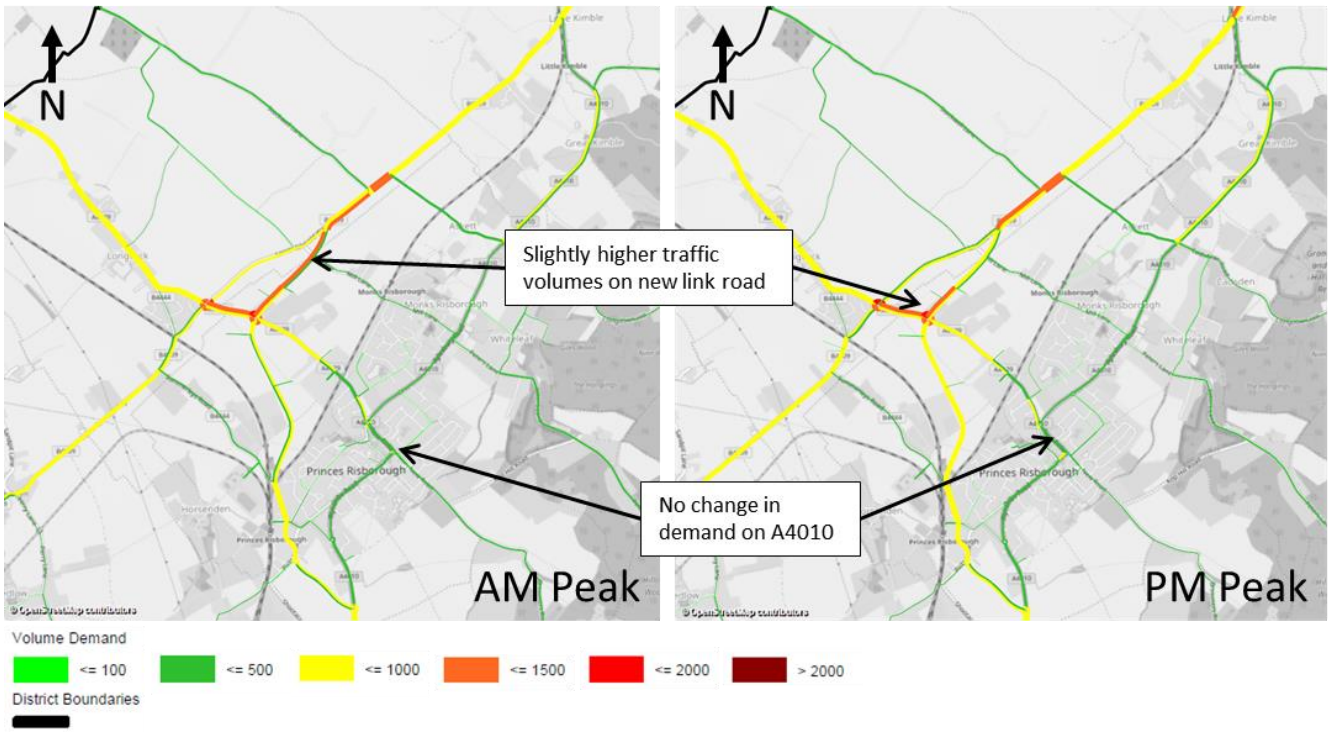


Figure 4.5: 2033 DS3 traffic demand flows during the AM and PM peak hours

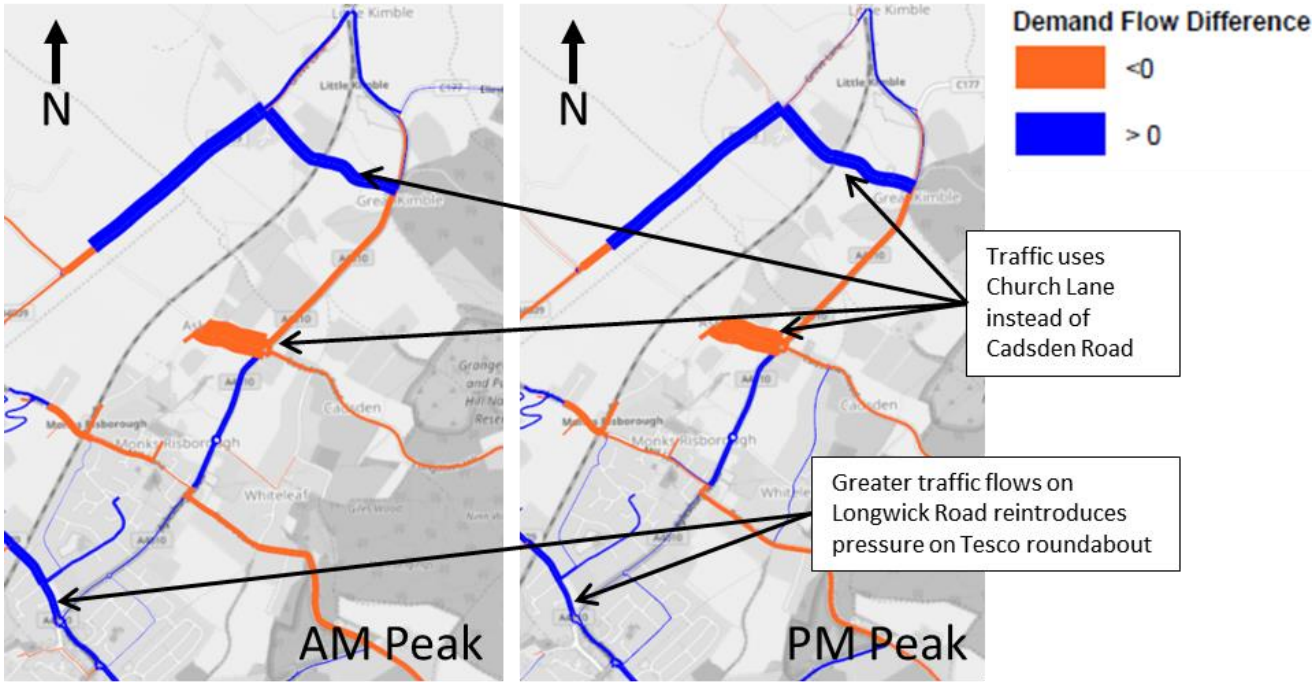


Figure 4.6: Flow difference plots (2033 DS1 vs 2033 DS2) during the AM and PM peak hours

A comparison of the demand flows in the DS1 and DS3 scenarios, as shown in Figure 4.7, demonstrates that the addition of the new site north of Lower Icknield Way has only marginal impacts in traffic flows in Princes Risborough. Further increases in traffic are seen between the B4009 and the new spine road, indicating that this site may add pressures to the two roundabouts at either end of this section. There is also a small increase in traffic at the Tesco roundabout, however it would not likely impact the roundabout's operation. There are no significant differences on the rest of Princes Risborough or beyond the Town Plan area.

A shift in traffic from Mill Lane to Longwick Road is seen in the AM peak. This is due to a zone in the strategic model being joined to the network in two locations with marginal difference in travel time between the two routes. In reality the zone represents a number of roads with different access points, and traffic from this area would likely distribute between both routes, so any change would likely be smaller than the model shows.

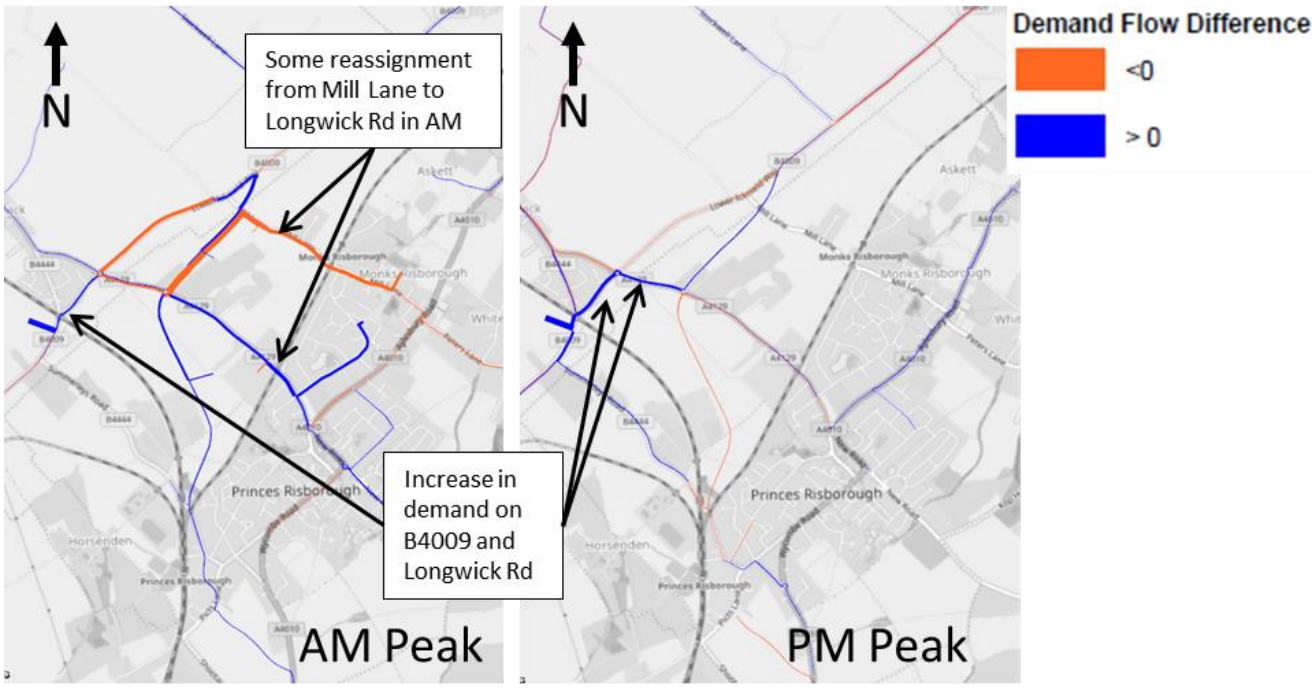
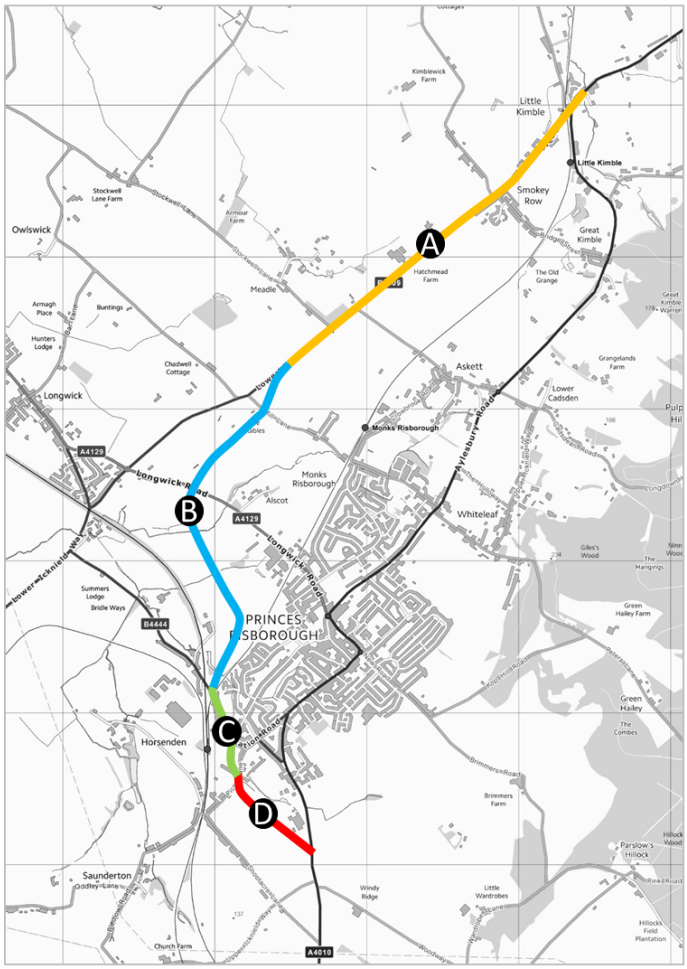


Figure 4.7: Flow difference plots (2033 DS1 vs 2033 DS2) during the AM and PM peak hours

The new link road will be the primary route for residents of the planned development and accommodate the majority of the development traffic. Following the implementation of the A4010 and wider transport package it will also be a more attractive route for traffic travelling north/ south (and vice versa). It is important therefore to compare the traffic flows with the capacity of the road. The context for the western relief road is largely urban so therefore the 2033 do something model flows are compared with the capacities highlighted in Table 2 of Design Manual for Roads and Bridges (DMRB) TA 79/99.

The relief road varies in type between Urban All Purpose (UAP) 1, UAP2, and UAP3. The road will be a two-way single carriageway with two lanes and carriageway width of 7.3m. Table 2 of DMRB TA 79/99 provides capacities (measured in vehicles per hour) for the busiest directional flow of 1,470 for UAP2, and 1,300 for UAP3. Figure 4.8 shows a comparison between the predicted model flows and the DMRB TA 79/99 capacities for DS1, DS2 and DS3 respectively. These show that each of the links' sections are within capacity in all three do something scenarios.



	Section of road	DMRB classification	DMRB capacity (busiest direction)
A	Lower Icknield Way	UAP2	1,470 vehicles
B	Summerleys Road to Lower Icknield Way	UAP3	1,300 vehicles
C	Summerleys Road to Picts Lane	UAP3	1,300 vehicles
D	Picts Lane to A4010	UAP3	1,300 vehicles

Lower Icknield Way

2033 DS1				2033 DS2				2033 DS3				Within Capacity
AM		PM		AM		PM		AM		PM		
NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	
1097	1077	1320	1033	1003	973	1191	931	1103	1085	1326	1019	Yes

Summerleys Road to Lower Icknield Way

2033 DS1				2033 DS2				2033 DS3				Within Capacity
AM		PM		AM		PM		AM		PM		
NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	
1158	781	1130	663	612	776	956	692	1161	699	1142	551	Yes

Summerleys Road to Picts Lane

2033 DS1				2033 DS2				2033 DS3				Within Capacity
AM		PM		AM		PM		AM		PM		
NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	
647	845	922	684	675	840	926	689	659	848	916	688	Yes

Picts Lane to A4010

2033 DS1				2033 DS2				2033 DS3				Within Capacity
AM		PM		AM		PM		AM		PM		
NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	
484	559	630	497	515	544	638	505	492	560	624	495	Yes

Figure 4.8: 2033 DS1, DS2 and DS3 flows vs DMRB TA 79/99 during the AM and PM peak hours

The wider impacts of the proposed development have also been considered in terms of the changes in traffic demand volumes at Chinnor, Thame, Terrick Roundabout, and Pedestal Roundabout. Demand flows represent the traffic that wants to use each road so therefore shows the maximum number of development car trips that could use these routes. The flow difference plots for these areas are shown in Figure 4.9. Only the DS1 flows are presented as the changes to the DS2 road network and additional employment space in the DS3 land use do not result in significant traffic reassignment outside of the Princes Risborough area. The difference in traffic flow is also reported in Table 4.2.

These show that there are increases in the demand volumes at Chinnor, Thame, Terrick Roundabout, and Pedestal Roundabout as a result of the changes in Princes Risborough. The greatest difference in traffic volumes is reported in the AM peak hour on the B4009 Lower Icknield Way, Chinnor, where there is a two-way traffic increase of 182 vehicles during the hour. This two way traffic flow is comprised of 102 vehicles travelling westbound and 80 vehicles travelling east bound along the B4009 at Chinnor in the AM peak hour. In the PM peak hour the two way traffic flow is lower at 137 vehicles (65 westbound and 71 eastbound).

The increase in two-way traffic flows at Thame is lower than those at Chinnor. The greatest increase in demand flow is 97 vehicles in the AM peak hour, of which 73 are travelling towards Thame and 24 from Thame. The two way demand flow in the PM peak hour on the same link is 83 vehicles and all of these are travelling from the Thame area.

The traffic volumes at the Pedestal Roundabout increase by 70 two-way vehicle movements in the PM peak hour, and the increase at the Terrick Roundabout is approximately 130 two-way vehicles in the PM peak hour.

Road/ Location	2033 DM (vehicles)		2033 DS1 (vehicles)		Difference (vehicles)	
	AM	PM	AM	PM	AM	PM
Station Road/ Chinnor	2,683	2,838	2,748	2,878	65	40
B4009 Lower Icknield Way/ Chinnor	933	1,091	1,115	1,228	182	137
B4009 Oakley Road/ Chinnor	2,292	2,430	2,386	2,512	94	82
Tythrop Way/ Thame	635	813	675	838	40	25
B4012 Howland Road/ Thame	1,334	1,187	1,358	1,282	24	95
Kingsey Road/ Thame	1,390	1,385	1,487	1,468	97	83
Terrick Roundabout A4010 (south)	623	634	635	640	12	6
Terrick Roundabout A4010 (north)	1,880	1,877	1,987	2,006	107	129
Terrick Roundabout B4009	1,483	1,533	1,516	1,544	33	11
Pedestal Roundabout Bradenham Road	1,501	1,668	1,538	1,738	37	70
Pedestal Roundabout West Wycombe Road	2,629	2,572	2,672	2,630	43	58
Pedestal Roundabout A40	1,533	1,370	1,538	1,349	5	-21

Table 4.2: 2033 DS1 demand flow (two-way traffic in vehicles) difference vs 2033 do minimum at Chinnor, Thame, Terrick Roundabout, and Pedestal Roundabout

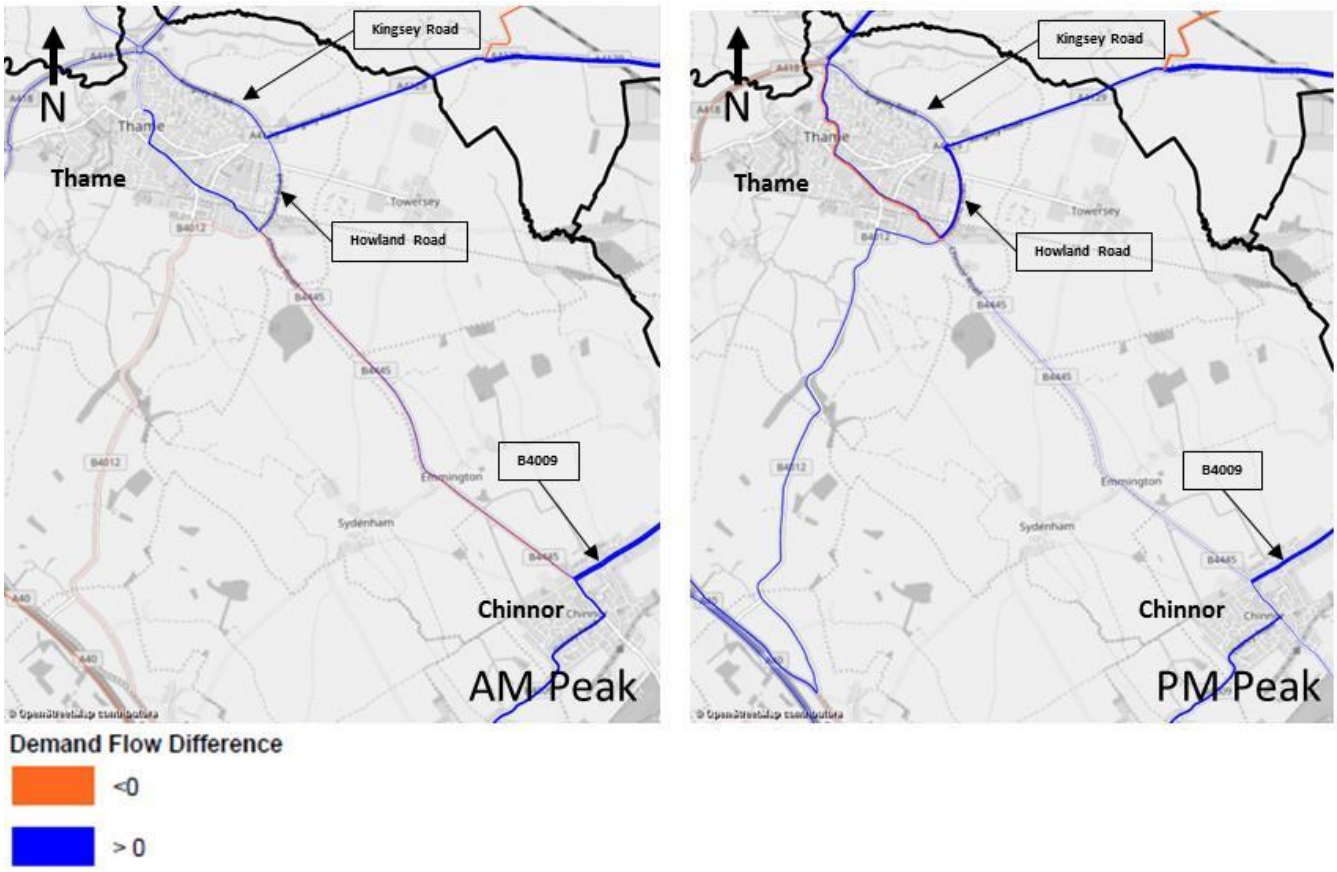


Figure 4.9: 2033 DS1 flows difference vs 2033 do minimum at Chinnor and Thame

4.3 Congestion ratios

The congestion ratio has been calculated for all modelled links in each scenario and time period. This has been calculated as the ratio of congested travel time to free-flow travel time on each link. The free flow time on a link is derived from the link length and free flow speed (the link speed when there is no delay in the network). The congested travel time is then calculated as a function of the free flow travel time, plus the link delay time and junction delay time downstream of the link.

Therefore an increase in travel time on a link is not only affected by increases in flow, but also by delays at the downstream junction. As a result, it is possible where junctions are constrained, to see congestion on a particular link without any significant increase in traffic flow. The links are categorised according to the criteria shown in Table 4.3.

Colour of the band	Congestion ratio	Interpretation
Transparent	1	Free flow conditions
Green	1 to 1.1	Travel times are between free flow and an increase in travel time of up to 10%
Yellow	1.2 to 2	Travel times are between 20% and 100% (i.e. two times) higher than free flow
Orange	2.1 to 3	Travel times are between 2.1 and 3 times higher than free flow
Red	>3	Travel times are more than three times higher than free flow

Table 4.3: Congestion ratio criteria

The congestion ratio plots for the 2033 do minimum, DS1, DS2 and DS3 are shown in Figures 4.10, 4.11, 4.12 and 4.13 respectively. These allow comparison to be made between scenarios.

The A4010 and B4009 experience congestion in the do minimum with journey times up to twice as long as free flow conditions. Review of the DS1, DS2 and DS3 congestion ratio plots (Figures 4.11, 4.12 and 4.13) shows that there is an improvement in travel time on New Road in the town centre.

The DS1 congestion ratios show that the addition of the new Local Plan development and the new relief road results in increased travel times on parts of Longwick Road, Mill Lane, Crowbrook Road, and Cadsden Road. The journey times on Mill Lane, Crowbrook Road, and Cadsden Road do not increase in the DS2 scenario, which is due to the changes in the Askett and Mill Lane areas.

The DS1, DS2 and DS3 travel times increase on the section of Longwick Road between the relief road and B4009, with the greatest increase occurring in the DS3. This suggests that the geometry of the Longwick Road/ Relief Road roundabout will need to be considered in further detail to ensure that this has sufficient capacity to accommodate the volume of traffic that will travel through this area in the future.

The signalised junction that has been introduced to the network close to the railway station does increase travel times in the vicinity of the junction, but this modelling suggests that it is not sufficient to deter drivers from using the new relief road. This is demonstrated by the traffic route choice in the north-south traffic plots shown in Figures 4.14.

4.4 North-south traffic routeing

The attractiveness of the relief road to north-south through traffic can be confirmed by interrogating the flows on the network that travel between two locations. Figure 4.14 shows the route choice of traffic travelling from a location north of the A4010/ Grove Lane junction and south of the A4010/ Shootacre Lane junction. It is considered that the A4010 package reinforces the attractiveness of the new relief road.

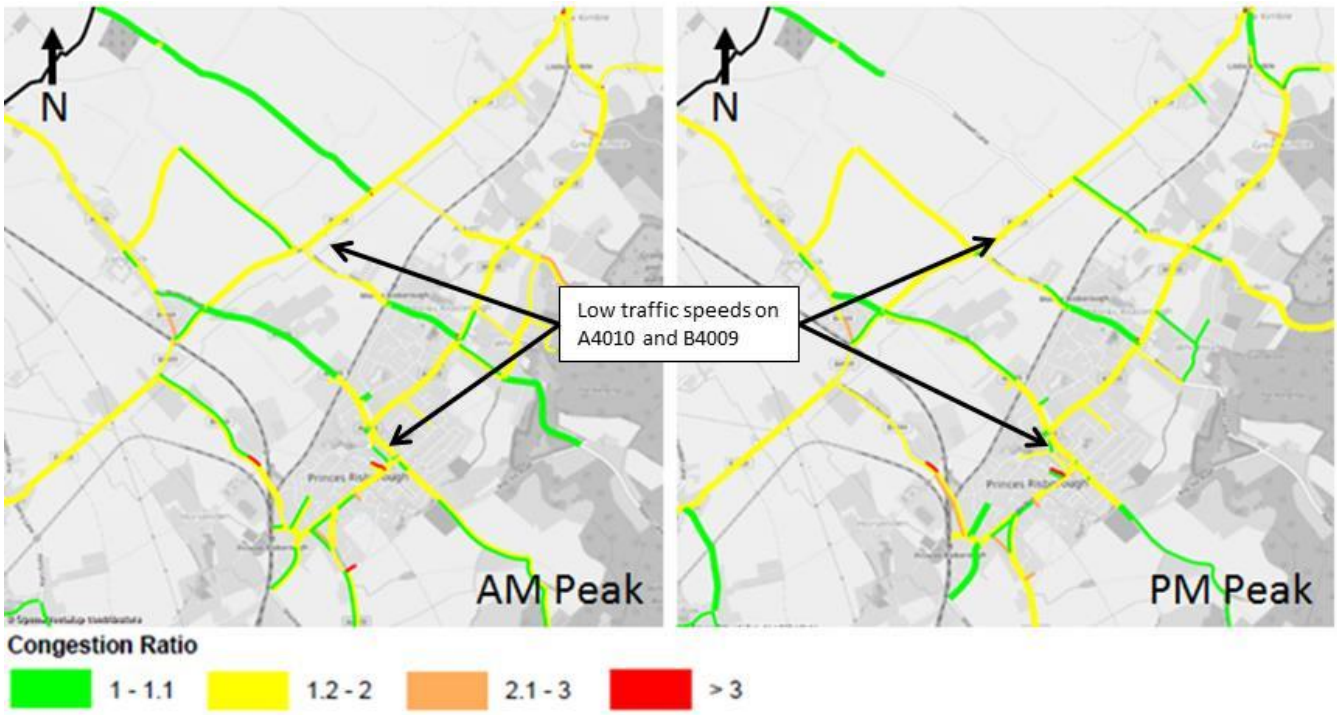


Figure 4.10: 2033 do minimum congestion ratio

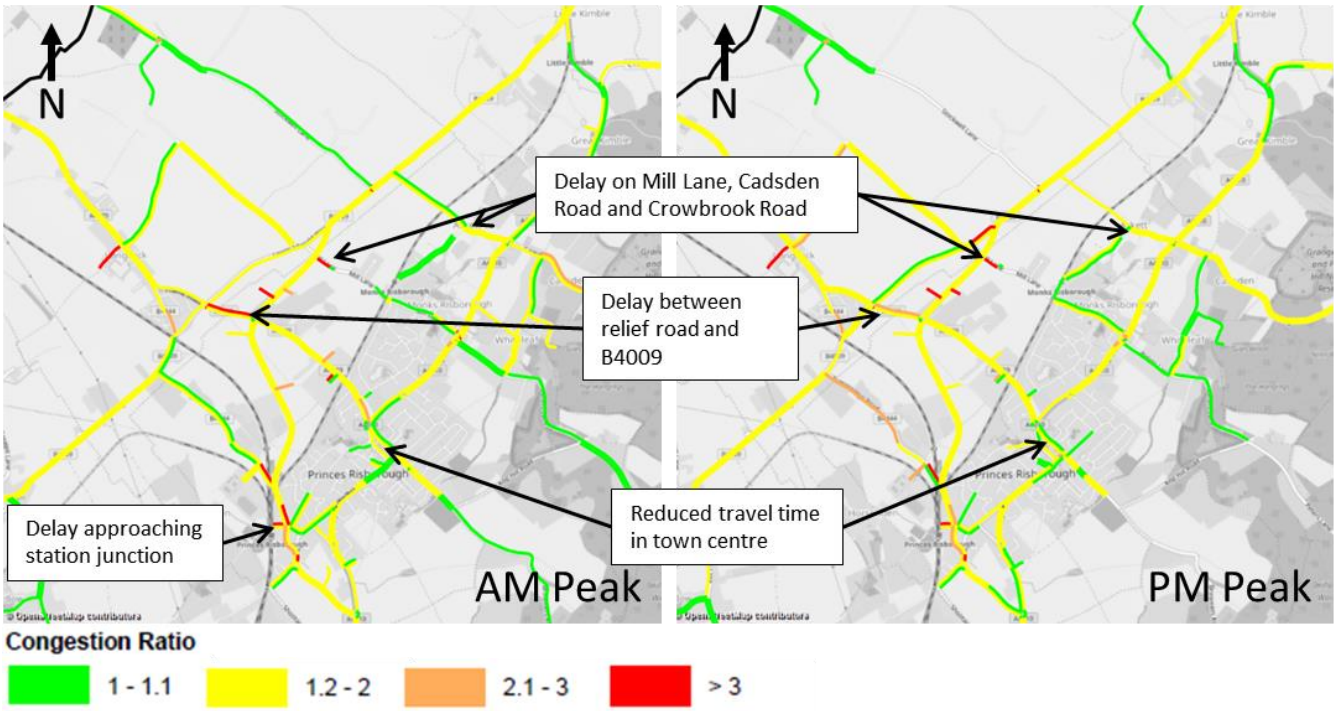


Figure 4.11: 2033 DS1 congestion ratio

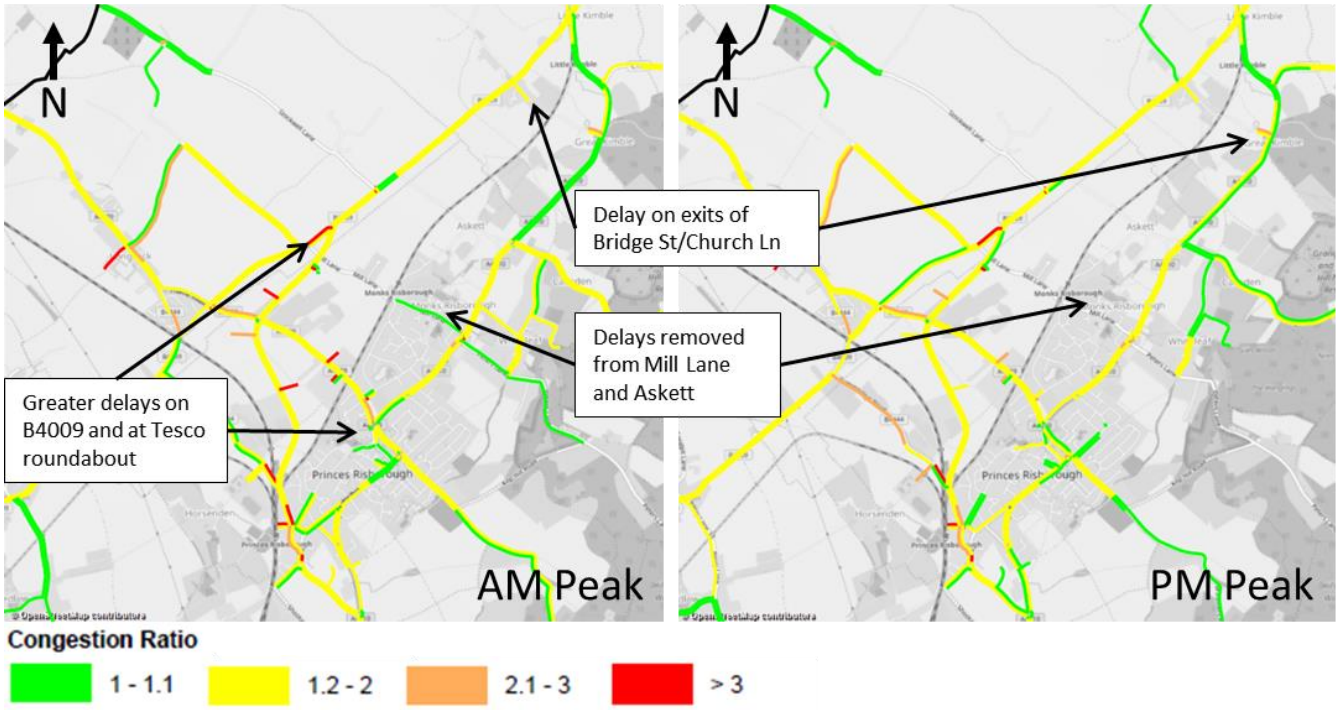


Figure 4.12: 2033 DS2 congestion ratio

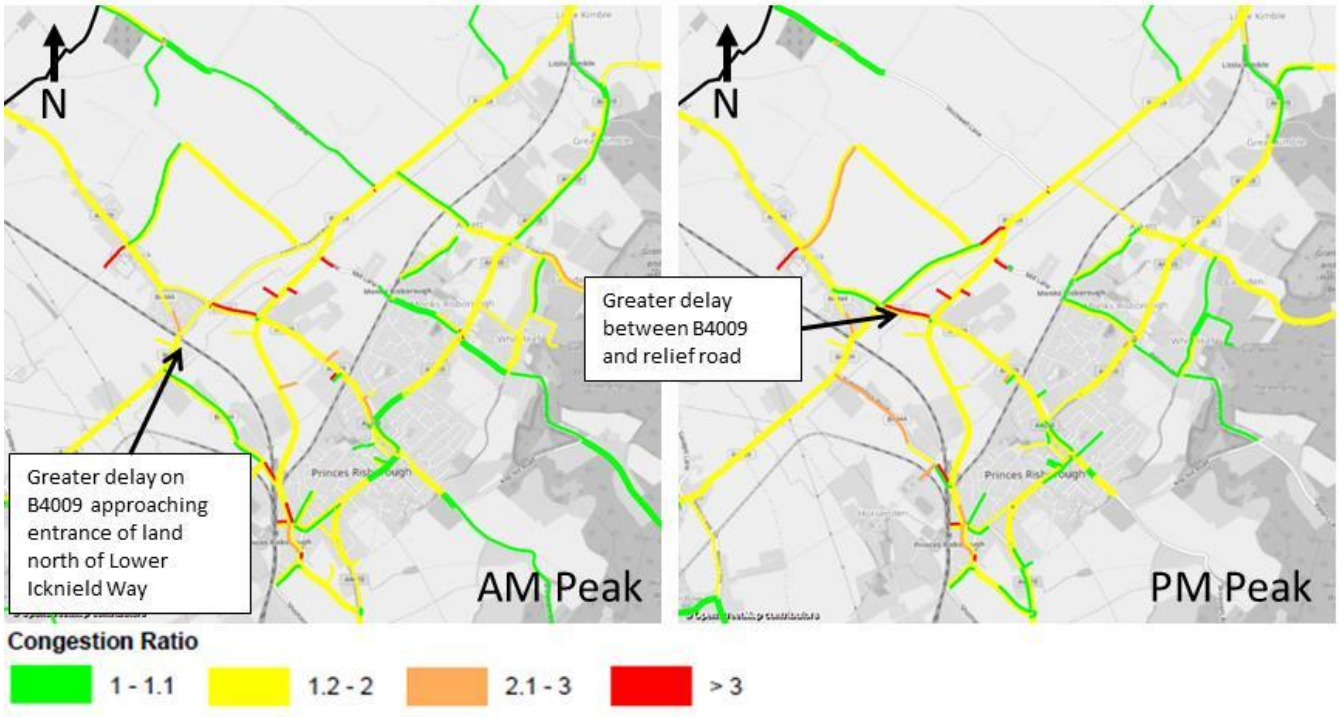


Figure 4.13: 2033 DS3 congestion ratio

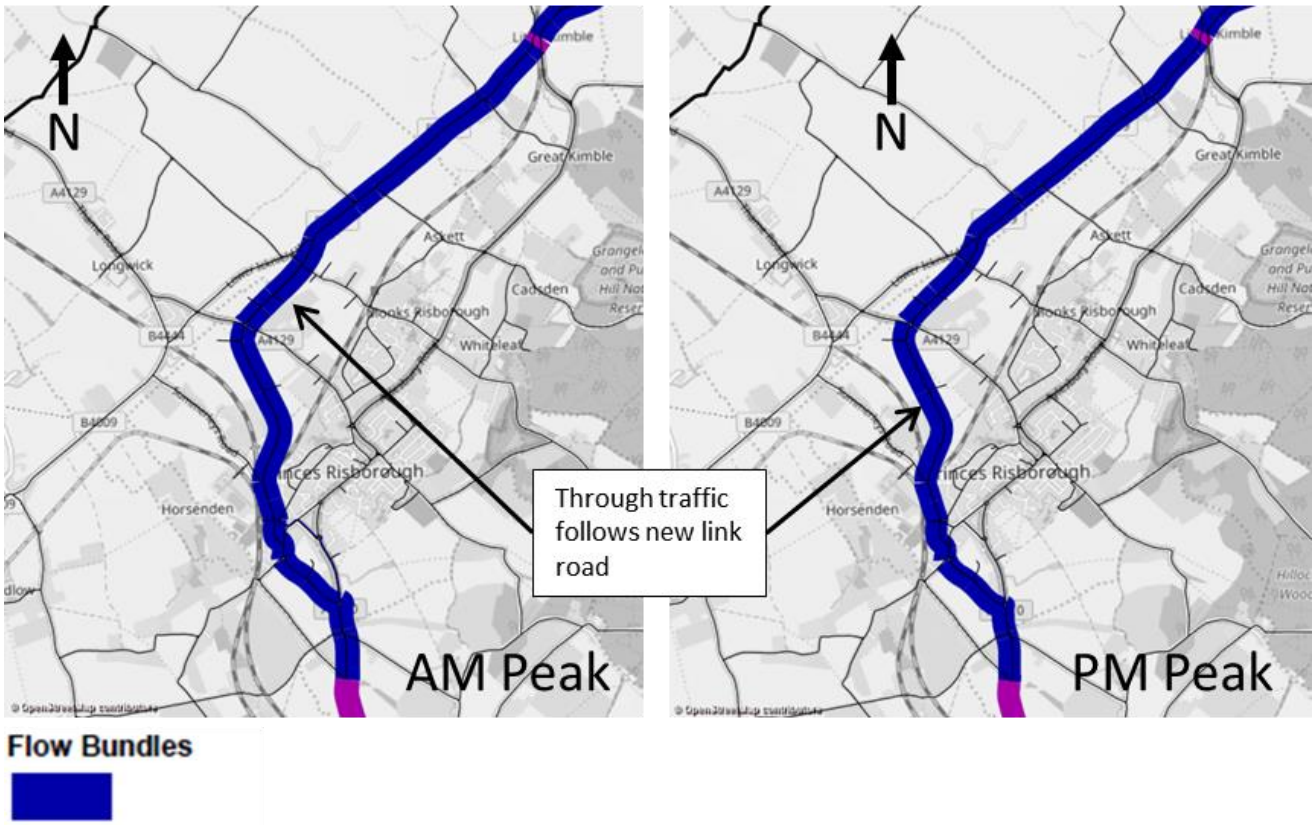


Figure 4.14: 2033 DS1 north-south traffic route choice

4.5 North-south traffic journey times

The north south journey times on the A4010 between Grove Lane and Shootacre Lane (shown in Table 4.4) increase in the 2033 do minimum scenario when compared to the base journey times. A comparison between the do minimum and DS1, DS2 and DS3 scenarios shows that there is an increase in north south journey time with the additional development, western relief road, and A4010 package. This is unsurprising given the scale of the expansion, the traffic generated, and the A4010 package that contributes to the reduction in vehicular speed and the local change of route choice of north south traffic.

A scenario where the development comes forward without the relief road has not been considered in this study, but the previous OAR studies did undertake an assessment of a previous iteration of the new Local Plan development, commensurate with the scope required for a strategic outline business case for a Western Relief Road scheme. This scenario essentially reflects unplanned and unmitigated growth in the Princes Risborough area.

The journey times from the previous OAR are reiterated in Table 4.5. These show that the relief road improves north south journey times by between 39 and 89 seconds when compared with the without relief road scenario.

Scenario/ Option	Direction	A4010		New Road Alignment	
		AM	PM	AM	PM
2013 base	Southbound	539 seconds	495 seconds		
	Northbound	521 seconds	583 seconds		
2033 DM	Southbound	561 seconds	528 seconds		
	Northbound	546 seconds	622 seconds		
2033 DS1	Southbound	676 seconds	631 seconds	669 seconds	575 seconds
	Northbound	663 seconds	730 seconds	599 seconds	683 seconds
2033 DS2	Southbound	685 seconds	639 seconds	669 seconds	583 seconds
	Northbound	672 seconds	739 seconds	605 seconds	688 seconds
2033 DS3	Southbound	687 seconds	644 seconds	681 seconds	586 seconds
	Northbound	687 seconds	758 seconds	617 seconds	700 seconds

Table 4.4: North-south journey times

Scenario/ Option	Direction	A4010	
		AM	PM
Do minimum plus development	Southbound	708 seconds	643 seconds
	Northbound	688 seconds	730 seconds

Table 4.5: North-south journey times (do minimum plus development) from Table 4.1 of the stage 1 options assessment report (February 2016)

5. Summary and conclusions

Jacobs is framework consultant to the Transport for Buckinghamshire Alliance (TfB) between Ringway Jacobs and Buckinghamshire County Council (BCC), and through this were appointed by Wycombe District Council (WDC) to provide transport consultancy advice with regards to the emerging new Local Plan.

The new Local Plan is being developed by WDC to allocate sites for housing that contribute to the districts objectively assessed needs, and employment land for business to expand on the Princes Estate. The purpose of this study is to understand the impact of the new Local Plan on the operation of the road network in and around Princes Risborough.

A localised calibration and validation exercise using traffic counts and journey times within the Princes Risborough area ensured that the new Local Plan base models meet WebTAG requirements.

The 2033 do minimum forecast model (which excludes the new Local Plan development and associated infrastructure) indicates 30% higher car traffic volumes in 2033 across the Buckinghamshire Districts, with notable increases in traffic on the A4010 through the centre of Princes Risborough and the B4009. As such, known congestion hotspots such as the A4010 New Road/ Duke Street/ Longwick Road/ A4010 Aylesbury Road roundabout, and the Grove Lane/ A4010 junction are forecast to experience further degradation in performance. This demonstrates that traffic volumes in Princes Risborough will increase regardless of whether the emerging new Local Plan development eventuates.

2033 models (do something) were created to include the new Local Plan development, western relief road, and A4010 package (do something 1), and the traffic management package for Askett and Mill Lane (do something 2), and land north of Lower Icknield Way (do something 3).

Comparison of the 2033 do something traffic flows with the do minimum shows that there has been a reduction in the demand flow on the A4010 in both the DS1, DS2 and DS3 scenarios. The DS2 plots also show that there has been a reduction in traffic on Mill Lane and Cadsden Road. The majority of traffic that was using Mill Lane and Cadsden Road is shifting to Longwick Road via New Road in the town centre, and Church Lane/ Bridge Street in Great Kimble. Further consideration should be given to the package of traffic management measures.

The new link road will be a preferred route for new residents and accommodate the majority of the development traffic. Following the implementation of the A4010 and wider transport package it will also be a more attractive route for traffic travelling north/ south (and vice versa). Each of the links' sections are within capacity in each of the DS1, DS2 and DS3 scenarios. A consequence of this however is that there are high traffic volumes on the section of relief road outside of the railway station and on Summerleys Road, south of the railway bridge.

The wider impacts of the proposed development have also been considered in terms of the changes in traffic demand volumes at Chinnor, Thame, Terrick Roundabout, and Pedestal Roundabout. The greatest difference in traffic volumes is reported in the AM peak hour on the B4009 Lower Icknield Way, Chinnor. There is an increase of 182 vehicles during the hour.

Review of the DS1, DS2 and DS3 congestion ratio plots shows that there is an improvement in travel time on New Road in the town centre. The model shows that the new relief road is the preferred north south route for traffic travelling between the A4010/ Grove Lane junction and south of the A4010/ Shootacre Lane junction. It is considered that the A4010 package reinforces the attractiveness of the new relief road.

The DS1, DS2 and DS3 travel times increase on the section of Longwick Road between the relief road and B4009. This suggests that the geometry of the Longwick Road/ Relief Road roundabout will need to be considered in further detail to ensure that this has sufficient capacity to accommodate the volume of traffic that will travel through this area in the future. The signalised junction that has been introduced to the network close to the railway station does reduce travel times in the vicinity of the junction, but this modelling suggests that it is not sufficient in deterring drivers from using the new relief road.

A scenario where the development comes forward without the relief road has not been considered in this study, but the previous stage 1 options assessment report (February 2016) did undertake an assessment of a previous iteration of the new Local Plan development, commensurate with the scope required for a strategic outline business case. This shows that the relief road improves north south journey times when compared with the without relief road scenario presented in the previous the stage 1 options assessment report (February 2016).

The modelling shows that the forecast traffic volumes from the planned growth in housing and jobs can be accommodated in this location so long as extra road capacity is provided in the form of a new relief road. The new relief road allows traffic to avoid the town centre and the modelling shows that there is a reduction in traffic using New Road in Princes Risborough Town Centre. This supports aspirations to see an urban realm transformation in the town centre. The traffic management measures for Mill Lane and Askett are shown to be effective at reducing rat running in these areas, but introduce other effects that will need to be considered as the package develops.

There are increases in the demand volumes at Chinnor, Thame, Terrick Roundabout, and Pedestal Roundabout as a result of the changes in Princes Risborough. The greatest difference in traffic volumes is reported in the AM peak hour on the B4009 Lower Icknield Way, Chinnor, where there is an increase of 182 vehicles during the hour. The greatest increase in traffic volumes at the Pedestal Roundabout is 70 vehicle movements in the PM peak hour. The greatest increase at the Terrick Roundabout is approximately 130 vehicles in the PM peak hour.

Whilst the traffic generated by the proposed development can be accommodated locally with the addition of the relief road, the north south journey times increase (compared with the do minimum) for traffic travelling through the Princes Risborough area. However, the north south journey times are quicker than those in an unplanned and unmitigated growth scenario.

Appendix A. Uncertainty logs

Town Plan Modelling

Development Description	Forecast scenario	Planning Application Number	Application Status	Business Case 2033 Forecast Year Modelling	
				Included?	Quantum Assumption
Princes Risborough (NTEM zone 11UF6)					
Former Whiteleaf, Picts Lane	DM	14/05386/OUT	Permission granted	✓	60 houses and 24 flats (85 dwellings total)
Ker Maria Nursing Home	DM	15/05349/FUL	Permission granted	✓	70 dwellings (care home), 20 jobs (identified in planning application)
Leo Laboratories	DM	15/07349/FUL	Permission granted	✓	81 houses and 15 flats (96 dwellings)
Former HCA land at Regent Park	DM	16/06146/FUL	Permission granted	✓	7900 sqm of B1/B2/B8
Princes Risborough Secondary School	DS	n/a	n/a	✓	Expanded secondary school (6FE to 8FE). To generate 40 FTE jobs. Secondary school to remain in situ.
Princes Risborough Expansion (see concept plan for locations)	DS	No application yet (encompasses 15/07825/OUTEA, up to 500 dw at Park Mill Farm, appeal dismissed)	No application yet	✓	2,500 houses split over 7 blocks
				✓	1000 sqm business uses in one local centre
				✓	2FE primary school (480 pupils, 50 FTE jobs) and 1FE primary school (240 pupils, 25 FTE jobs)
				X	1200 sqm retail in one local centre (not to be included, assumed all to be internal/ pass-by/linked trips)
				x	Community uses in local centre community hall (not to be included, greatest trip generation assumed to be outside of peak hours)
Princes Estate expansion (west of Summerleys Road)	DS	No application yet	No application yet	✓	12,000 sqm business use B2 to accommodate relocated business (from Longwick Road) and Sumitomo (from Summerleys Road) and other additional employers
				✓	10,000 sqm new business use B1C.
Land off Poppy Road	DS	To be allocated		✓	C. 60 dwellings
Land north of Lower Icknield Way	DS3	To be reserved	No application yet	✓	10,000 sqm business use B2 to accommodate relocated business (from Longwick Road) in DS3 only
Rural (Wycombe) (NTEM zone 11UF0)					
Land off Boxer Road/ Barn Road	DM	14/06965/OUT	Appeal allowed	✓	160 dwellings to be included (note: application form states 175 houses)
Thame Road (OS parcels 6232 and 7428)	DS	15/08455/OUT	Pending consideration at time of modelling	✓	43 dwellings
Thame Road (Rose Farm)	DS	16/06675/OUT	Pending consideration at time of modelling	✓	65 dwellings

Stage 1 Option Assessment Report (dated 12/2/2016)

Development Description	Planning Application Number	Application Status	Business Case 2036 Forecast Year Modelling	
			Included?	Quantum Assumption
Princes Risborough (NTEM zone 11UF6)				
Former Whiteleaf, Picts Lane	14/05386/OUT	Resolution to grant planning permission subject to legal agreement.	✓	60 houses and 24 flats
Former Molins Sports Ground	14/07148/OUT	Application withdrawn	X	Not included (90 dwellings)
Ker Maria Nursing Home	15/05349/FUL	Pending consideration	✓	70 assisted living units
Leo Laboratories	No application yet	No application yet	✓	New secondary school. 2 form entry expansion
Princes Risborough Secondary School	No application yet	No application yet	✓	105 houses
Princes Risborough Expansion	No application yet	No application yet	✓	2,500 houses
			✓	2no primary schools 2 form entry and 1 form entry
			✓	27000 sqm business uses located as on preliminary masterplan
			✓	500 sqm retail in local centre
			✓	Community uses in local centre GP surgery, community hall
Rural (Wycombe) (NTEM zone 11UF0)				
Mill Lane	14/06162/OUT	Appeal in progress	X	192 dwellings
De Gravens Meadow	15/06332/OUT	Pending consideration	X	152 dwellings
Thame Road (OS parcel 2075)	14/08253/OUT	Application withdrawn	✓	20 dwellings
Land off Boxer Road/ Barn Road	14/06965/OUT	Pending consideration	✓	50 dwellings
Thame Road (OS parcels 6232 and 7428)	No application yet	No application yet	✓	50 dwellings
Thame Road (Rose Farm)	No application yet	No application yet	✓	20 dwellings