

# The Plan for Stafford Borough

## Key Performance Indicators

Staffordshire County Council

20 September 2013

ATKINS



Plan Design Enable

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# 1. Introduction

- 1.1. This report details the global assessment of the network infrastructure improvements proposed to mitigate the Western, Eastern and Northern Directions of land use growth respectively for Stafford Town.
- 1.2. The overall assessment has focussed on two scenarios, namely:
  - Do Minimum – with land use growth but excluding strategic network improvements; and
  - Do Something – with both land use growth and strategic network improvements.
- 1.3. The level of overall development growth for Stafford between 2011 – 2031 has been specified as follows:
  - Net Household Growth – 5,560 houses; and
  - Net Employment Growth – 36 hectares.
- 1.4. The strategic highway network improvements proposed and assessed are as follows:
  - Stafford Western Access Improvements;
  - A Local Distributor Road linking A34 to Sandon Road (north); and
  - An Eastern Distributor Road between Beaconside and St Thomas Lane
- 1.5. This report only quantifies the overall impact of these three highway improvements. It does not quantify the impact of the wider Integrated Transport Strategy for Stafford, which is also being promoted.
- 1.6. A detailed analysis of the impact of these road schemes can be found in the following reports:
  - Transport Evidence to Support a Western Direction of Growth, November 2012;
  - Transport Evidence to Support a Northern Direction of Growth, June 2013; and
  - Stafford Eastern Distributor Road Indicative Economic Assessment, May 2013.

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## 2. Performance Indicators

- 2.1. In order to understand the impacts of the proposed network improvements, to mitigate the development growth strategy for Stafford, an assessment has been undertaken of key performance indicators between the Do Minimum (without improvements) and Do Something (with Improvements) scenarios. This has been undertaken using the SATURN Stafford Transport Model and Accession and has focussed on the 2031 design year to evaluate the changes in overall performance.
- 2.2. An assessment of the collective impact of these network improvements has been made based upon their performance against 7 objectives:
- Impact on all users;
  - Impact on strategic routes;
  - New development trips;
  - Network impacts;
  - Environmental impacts;
  - Access to existing public transport; and,
  - Access to non motorised modes.
- 2.3. These criteria have been further split into 19 local sub objectives to provide a comprehensive assessment of the options. The overall Key Performance Indicators (KPIs) are shown in Table 2.1.
- 2.4. The assessment of the schemes against the KPIs is summarised in the following section.

**Table 2.1 – Key Performance Criteria**

Objective	Local Sub Objective
Impact on all users	Vehicle Hours
	Vehicle Kilometres
	Average Speed
	Average vehicle distance per trip
	Demand
Impact on strategic routes	Change in Flow on the M6
New Development Trips	Development Trip Vehicle Hours
	Development Trip Vehicle Kilometres
	Development Trip Average Speeds
	Development Trip average trip length
	Development Demand
Network Impacts	Junctions
	Links
Environmental Issues	Impact on CO2 emissions
	Impact on NOX emissions
Access to Existing Public Transport	Total Number of existing services passing the developments
	Direct access to Rail
Access to non motorised modes	Access to national cycle network
	Percentage of development land with access to the town centre within 15 minutes

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## 3. Option Assessment

- 3.1. This section outlines the assessment of the Key Performance Indicators (KPIs) for the Do Minimum and Do Something scenarios. Based on these results the options have been ranked from 1 to 2, with 2 being the worst, according to how they compared against one another.
- 3.2. The rankings were reviewed to allow options to be, for example, first-equal, if the differences between two options were insignificant.
- 3.3. Appendix A – Detailed Evaluation of Options contains the qualitative and quantitative information used for the assessment, and shows how the options were ranked for each of the 19 local sub-objectives. The methodology used to rank the options against each objective is also described.
- 3.4. A summary of each of the sub objectives is provided in Table 3.1. and the key points to note are outlined in the following sections:

### Impact on All Users

- 3.5. The assessment of the impacts on all highway users has been undertaken against four key criteria and the results are summarised below. It is noted that these results consider all movements within the modelled area and hence include the M6 trips passing through the region. As a result the impact within Stafford is diluted as the proposed improvements will have limited affect to these long distance movements.
  - The number of vehicle hours is the sum of trip times for all trips that occur in the transport model. Therefore, if you assign the same demand to two networks, the network with the lower vehicle hours is the one that, on average, allows users to complete their trips in less time. Overall the Do Something provides the lowest vehicle hours compared to the Do Minimum with a reduction of around 1.8% – 2.7% (around 250 and 350 vehicle hours) in the AM and PM peak periods respectively.
  - The average speeds of trips within the model give an indication of how well traffic is moving around the network in the peak periods. Overall the average speed has increased in the Do Something scenario by between 1.5 – 2.2% (around 1kph faster) in the AM and PM peaks respectively. This increase is due to the additional road capacity and associated junction improvements proposed.
  - The trip length indicator shows how average journey length will change in response to the introduction of highway network improvements, but also how it changes in response to congestion within the model. Overall between the Do Minimum and Do Something scenarios there is a slight reduction in average trip length of around 0.4% (around 0.1km) reflecting the introduction of the highway improvements; and
  - Overall, the level of demand is consistent between the Do Minimum and Do Something scenarios.



Table 3.1 – Option Evaluation Summary Table

Objective	Local Sub Objective	Scenario	
		Do Minimum	Do Something
Impact on all users	Vehicle Hours	2	1
	Vehicle Kilometres	1	1
	Average Speed	2	1
	Average vehicle distance per trip	1	1
	Demand	1	1
Impact on strategic routes	Change in Flow on the M6 Motorway	1	1
New Development Trips	Development Trip Vehicle Hours	2	1
	Development Trip Vehicle Kilometres	1	1
	Development Trip Average Speeds	2	1
	Development Trip average trip length	1	1
	Development Demand	1	1
Network Impacts	Junctions	2	1
	Links	2	1
Environmental Issues	Impact on CO2 emissions	2	1
	Impact on NOX emissions	2	1
Access to Existing Public Transport	Developments with access to bus network	2	1
	Direct access to Rail	1	1
Access to non motorised modes	Access to national cycle network	1	1
	Percentage of development land with access to the town centre within 15 minutes	1	1

Key: 1 = best, 2 =worst

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## Impact on Strategic Routes

- 3.6. The assessment of the changes in trips on the M6 around Stafford has shown that the introduction of the proposed improvements has a minimal overall impact in terms of demand. Overall the number of trips on the M6 is forecast to change by below 1% with the M6 between 13 – 14 and north of J14 actually showing a reduction in flow. This slight change in flow is due to potential rerouting of movements travelling to and from Stafford via the motorway due to the highway schemes included in the Do Something. Existing problems along the M6 are expected to be mitigated by the proposed Highways Agency Managed Motorway Scheme between M6 junction 13 to 15. This is subject to finalisation of the options and consideration of their business case and deliverability. Once implemented the potential for disruption of the M6 to affect the local highway network in Stafford will be significantly reduced

## Impacts on New Development Trips

- 3.7. The assessment of impacts on new development trips has shown that:
- The Do Something scenario shows an overall decrease in vehicle hours, vehicle kilometres and a reduction in average trip length compared to the Do Minimum as highlighted below.
    - Development trip vehicle hours are forecast to reduce by between 6 – 11% (around 100 and 200 vehicle hours) in the AM and PM peaks respectively;
    - Development vehicle kilometres are forecast to reduce by between 1 – 2% (around 1,100 to 1,900 kilometres) in the AM and PM peaks respectively;
    - Development vehicle speeds are forecast to increase by between 5 – 9% (around 2.4 and 4.1 kph) in the AM and PM peaks respectively;
    - The average vehicle journey length is also forecast to reduce by between 1.4 – 2.2% (around 0.2 kilometres) in the AM and PM peaks respectively.
    - Overall, the level of demand is consistent between the Do Minimum and Do Something scenarios.

## Network Impacts

- 3.8. An assessment has been undertaken of the overall network impacts in the key study area. These have considered the following:
- Average link stress – where the volume to capacity (V/C) ratio is greater than 85%; and
  - Average junction stress – where the volume to capacity (V/C) ratio is greater than 85% or the average delay is greater than 30 seconds or the average queue is greater than 10 vehicles;
- 3.9. A V/C ratio has been primarily used as it is recognised that where this increases above 85% then the link or junction is assumed to be approaching capacity and hence any additional flow may cause significant increases in delays and queuing (i.e. over capacity).
- 3.10. Diagrams showing the links and junctions meeting this criteria within the key simulation network, for each option and time period, are provided in Appendix B.
- 3.11. This indicator has highlighted the following points:
- Overall the Do Something scenario has reduced the number of over capacity links and junctions compared to the Do Minimum
    - Over capacity junctions reduced by 12.7% (8 junctions) and 28.4% (19 junctions) in the AM and PM peaks respectively; and
    - Over capacity links reduced by 23.4% (18 links) and 23.0% (17 links) in the AM and PM peaks respectively.

- 
- 3.12. Consideration of the impacts around the three key network improvements highlights the following:
- The introduction of the Stafford Western Access Improvements has reduced the delays and overcapacity links and junctions around Doxey Road, Chell Road and Newport Road;
  - The Local Distributor Road linking A34 to Sandon Road reduces the delays and overcapacity on Stone Road to the North of the North Avenue and along the northern section of Beaconside.
  - The Eastern Distributor Road between Beaconside and St Thomas Lane reduces overcapacity on Weston Road / Cull Avenue and Blackheath Lane / Tixall Road junctions as well as on the A518 to the east of Beaconside. It is recognised that additional traffic is drawn into this corridor, due to the improvements, causing Baswich Lane junctions to increase in overcapacity to the south of St Thomas Lane and additional traffic increases along Beaconside to the north of Weston Road.
- 3.13. Consideration of both the AM and PM peak Do Something networks highlights residual traffic problems within Stafford irrespective of the proposed improvements and hence may require further mitigation measures. These may be summarised as follows:
- A34 Stone Road (between Eccleshall Road and Balfour Grove);
  - A34 Lichfield Road (between A449 and Weeping Cross);
  - Junctions along the A518 Newport Road (between Kingsway and Bridge Street);
  - A449 between Gravel Lane and West Way; and
  - A513 Beaconside (between Sandon Road (N) and Sandon Road (S) and between the Technology Park and Weston Road).

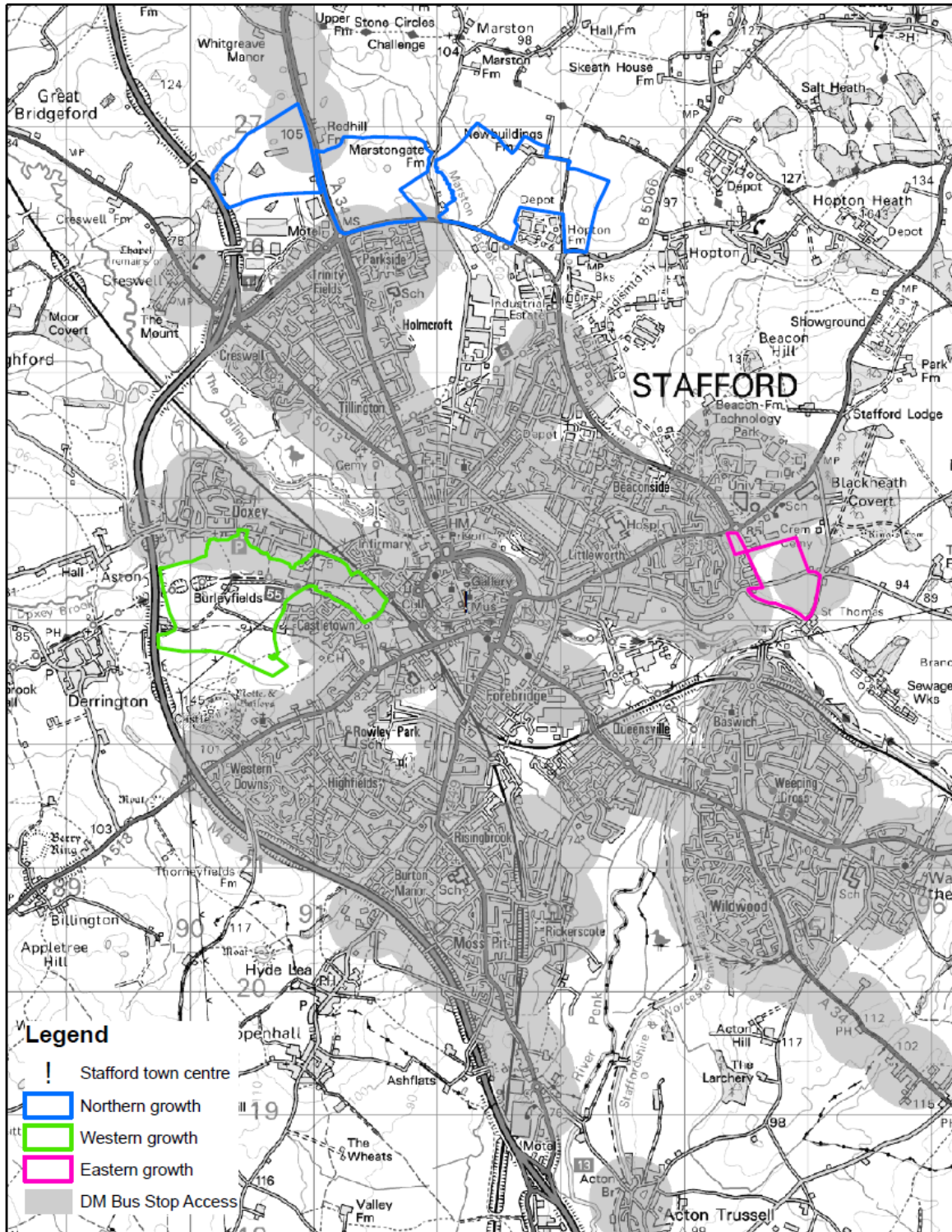
## Environment

- 3.14. A review of the environmental indicators extracted from the SATURN model runs has been undertaken. It is recognised that SATURN provides only a simplified emissions model and hence the validity of these results should be treated in this light. The results do, however, provide a like-for-like comparison of the options and hence the results have highlighted:
- For both the Carbon Dioxide and Nitrogen Oxide levels the network improvements and reduced congestion across the network as a whole reduces the environmental impacts by between 1% to 2% in the peak periods.

## Access to Public Transport

- 3.15. Regarding the access to public transport it has been considered reasonable that patrons will walk up to 400 metres to a bus stop. Based on this the level of access to a bus stops for the new development trips within this distance in both the Do Minimum and Do Something scenarios is provided in Figures 3.1 and 3.2. This shows that, the introduction of the Western Access Improvements and the Local Distributor Road linking A34 to Sandon Road, in particular, allow better penetration into the new developments for buses and hence have a significant increase in the level of pedestrian access as highlighted below.
- The Do Something scenario reduces the percentage of new development trips without access to Bus from 71.3% in the Do Minimum to 10.2%.
- 3.16. The results of the rail access assessment were as follows:
- The rail station in Stafford is centrally located and so 15 bus routes serve the station directly. However, due to its central location it is noted that any of the current bus routes could be combined with a short walk to reach the rail station. For this reason, both the Do Minimum and Do Something scenarios scored equal for access to rail.

Figure 3.1 – Do Minimum Access to Public Transport Networks within 400m



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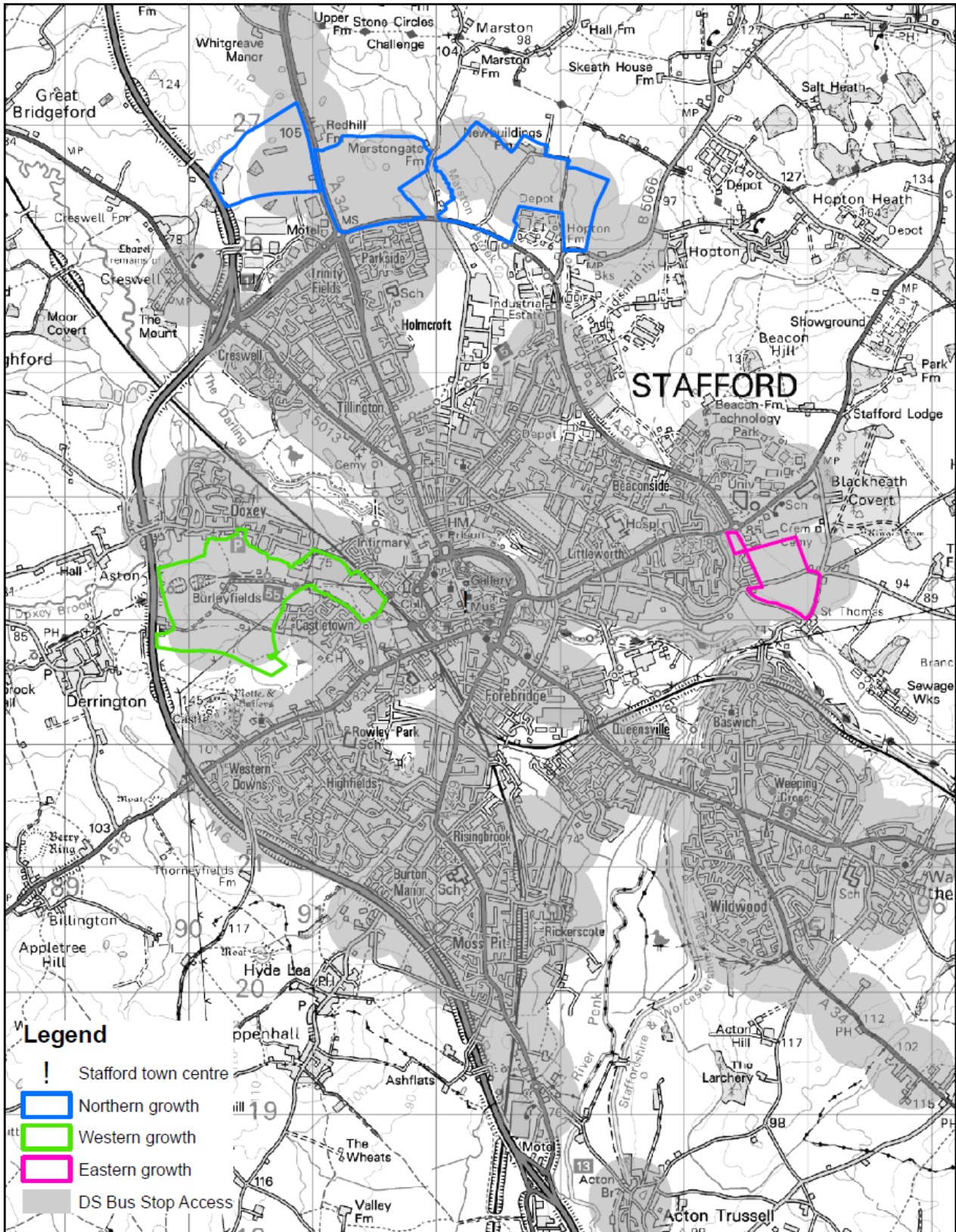
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Figure 3.2 – Do Something Access to Public Transport Networks within 400m



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## Access to Non Motorised Modes

- 3.17. In general Stafford caters well for cyclists and other non-motorised users as there is a comprehensive cycle network as shown in Appendix B. This indicator has considered what proportion of the new development trips can access the town centre within 15 minutes through cycling. This has assumed a cycle speed of 16kph with a maximum 350m access to a cycle network.
- 3.18. Overall this assessment has shown that in both scenarios around 44% of development trips would have access within these criteria.
- 3.19. It is noteworthy that the access arrangements required for the Eastern and Western directions of growth result in the sites being within a 15 minute cycle journey of the town centre. However the geographical location of the Northern direction of growth, means that it lies beyond a 15 minute cycle journey that cannot be mitigated for.

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## 4. Summary

- 4.1. This report has outlined the results of a key performance indicator assessment of the proposed highway network mitigation schemes for the Western, Eastern and Northern Directions of land use growth for Stafford Borough.
- 4.2. These KPI's have highlighted that the proposed schemes are forecast, by 2031, to improve the overall performance of the highway network in 9 of the 19 indicators compared to the Do Minimum scenario. For the remaining 12 indicators, whilst the Do Something shows a small improvement compared to the Do Minimum for most of these, it has been considered that the two scenarios provide a consistent level of service. Overall these mitigation measures have been shown to improve the journeys of both all trips within the modelled area as well as the new development trips specifically.
- 4.3. Key link and junction improvements have been highlighted which are associated with the three network schemes including:
- Stafford Western Access Improvements - Doxey Road, Chell Road and Newport Road;
  - The Local Distributor Road linking A34 to Sandon Road - Stone Road to the North of the North Avenue and along the northern section of Beaconside.
  - The Stafford Eastern Distributor Route (Phase 1) - Weston Road / Cull Avenue and Blackheath Lane / Tixall Road junctions as well as on the A518 to the east of Beaconside
- 4.4. It is recognised, however that there are other routes which exceed the criteria specified irrespective of the proposed improvements and hence may require further assessment. These may be summarised as follows:
- A34 Stone Road (between Eccleshall Road and Balfour Grove);
  - A34 Lichfield Road (between A449 and Weeping Cross);
  - Junctions along the A518 Newport Road (between Kingsway and Bridge Street);
  - A449 between Gravel Lane and West Way; and
  - A513 Beaconside (between Sandon Road (N) and Sandon Road (S) and between the Technology Park and Weston Road).

# Appendix A. Detailed Evaluation of Options



## Objective:

## Impact on Strategic Routes

## Sub Objectives:

## Flows on the M6

### Methodology

This assessment has considered the total flows on the M6 around Stafford



### Results

	Do Minimum		Do Something	
	AM	PM	AM	PM
<b>M6 North of J14</b>				
Northbound	3894	3957	3886	3971
Southbound	3945	4041	3942	4060
Total	7839	7999	7828	8031
% Change Rel DM	-	-	-0.1%	0.4%
<b>M6 Between J13 and J14</b>				
Northbound	4528	4642	4489	4618
Southbound	4598	4796	4591	4737
Total	9126	9439	9080	9355
% Change Rel DM	-	-	-0.5%	-0.9%
<b>M6 South of J13</b>				
Northbound	4684	4781	4692	4786
Southbound	4906	4961	4907	4963
Total	9590	9742	9599	9749
% Change Rel DM	-	-	0.1%	0.1%

### Overall Score

Objective	Sub Objective	Do Minimum	Do Something
Impacts on the Strategic Routes	Impacts on the M6	1	1

## Objective:

## Impacts on Development Users

## Sub Objectives:

## Various development Traffic Indicators

### Methodology

This objective has considered the following:

<b>Vehicle Hours</b>	Total vehicle hours for trips to and from the new developments
<b>Vehicle Kilometres</b>	Total vehicle kilometres for trips to and from the new developments
<b>Vehicle Speeds</b>	The Average speed for trips to and from the new developments
<b>Average Trip Length</b>	The Average trip length within the model area for trips to and from the new developments
<b>Development Demand</b>	The total trip demand to and from the new developments

### Results

	Do Minimum		Do Something	
	AM	PM	AM	PM
<b>Vehicle Hours</b>	1689	1992	1581	1780
% Change Rel to DM	-	-	-6%	-11%
<b>Vehicle Kilometres</b>	75720	86444	74656	84579
% Change Rel to DM	-	-	-1%	-2%
<b>Vehicle Speeds (km/hr)</b>	44.8	43.4	47.2	47.5
% Change Rel to DM	-	-	5.3%	9.5%
<b>Average Trip Length (km)</b>	9.6	9.7	9.4	9.5
% Change Rel to DM	-	-	-1.4%	-2.2%
<b>Development Demand</b>	7901	8913	7901	8913
% Change Rel to DM	-	-	0%	0%

### Overall Score

Objective	Sub Objectives	Do Minimum	Do Something
Impact on all Users	Vehicle Hours	2	1
	Vehicle Kilometres	1	1
	Vehicle Speeds (km/hr)	2	1
	Average Trip Length (km)	1	1
	Network Demand	1	1

## Objective:

## Impact on All Users

## Sub Objectives:

## Various Traffic Indicators

### Methodology

This objective has considered the following:

<b>Vehicle Hours</b>	Total vehicle hours for trips within the model area
<b>Vehicle Kilometres</b>	Total vehicle kilometres for trips within the model area
<b>Vehicle Speeds</b>	The Average speed for trips within the model area
<b>Average Trip Length</b>	The Average trip length for trips within the model
<b>Development Demand</b>	The total trip demand

Note: Model area includes the M6 and trips using this route

### Results

	Do Minimum		Do Something	
	AM	PM	AM	PM
<b>Vehicle Hours</b>	13374	13418	13131	13059
% Change Rel to DM	-	-	-1.8%	-2.7%
<b>Vehicle Kilometres</b>	806683	808440	803992	804041
% Change Rel to DM	-	-	-0.3%	-0.5%
<b>Vehicle Speeds (km/hr)</b>	60.3	60.2	61.2	61.6
% Change Rel to DM	-	-	1.5%	2.2%
<b>Average Trip Length (km)</b>	19.0	18.4	18.9	18.3
% Change Rel to DM	-	-	-0.3%	-0.5%
<b>Network Demand</b>	42430	44016	42430	44016
% Change Rel to DM	-	-	0.0%	0.0%

### Overall Score

Objective	Sub Objectives	Do Minimum	Do Something
Impact on all Users	Vehicle Hours	2	1
	Vehicle Kilometres	1	1
	Vehicle Speeds (km/hr)	2	1
	Average Trip Length (km)	1	1
	Network Demand	1	1

## Objective:

## Network Impacts

## Sub Objectives:

## Impacts on Junctions and Links

### Methodology

This objective has considered the following:

#### Junctions

An assessment has been undertaken of the number of junctions with an average V/C of >85% or average delay >30 seconds or average queue >10 vehicles

#### Links

An assessment has been undertaken of the number of links with an average V/C of >85%

#### Note:

These indicators have been assessed using the SATURN model for the key simulated area and link capacities have been calculated based on DMRB Vol 5 Section 1 Part 3

A V/C Ratio of 85% is considered to represent links and junctions which are approaching capacity and hence beyond this significant delays and queuing may occur.

### Results

	Do Minimum		Do Something	
	AM	PM	AM	PM
<b>No of Junctions meeting criteria</b>	63	67	55	48
% Change Rel to DM	-	-	-12.7%	-28.4%
<b>No of Links V/C &gt;85%</b>	77	74	59	57
% Change Rel to DM	-	-	-23.4%	-23.0%

### Overall Score

Objective	Sub Objectives	Do Minimum	Do Something
Network Impacts	No of Junctions meeting criteria	2	1
	No of Links V/C >85%	2	1

## Objective:

## Environment

## Sub Objectives:

## CO2 and NOX

### Methodology

An assessment of the levels of both Carbon Dioxide and Nitrogen Oxide has been undertaken. This has used the direct outputs from the SATURN forecast model assignments and hence the accuracy of these results should be considered in this light.

### Results

	Do Minimum		Do Something	
	AM	PM	AM	PM
<b>CO2 (Kg/hour)</b>	22826	22979	22400	22519
% Change Rel to DM	-	-	-1.9%	-2.0%
<b>NOX (Kg/hour)</b>	529	527	523	523
% Change Rel to DM	-	-	-1.2%	-0.9%

### Overall Score

Objective	Sub Objective	Do Minimum	Do Something
Environment	CO2 (Kg/hour)	2	1
	NOX (Kg/hour)	2	1

**Objective:**

**Access to Public Transport**

**Sub Objectives:**

**Access to existing services**

**Methodology**

**Access to Buses**

The number of AM Peak development trips without access to existing bus routes within a 400m walk

It is noted that in both options some developments are not within a 400m walk (333m straight-line distance) of the bus network. The schemes have been scored dependent on the number of developments that don't have walkable access to the bus network.

**Access to Rail**

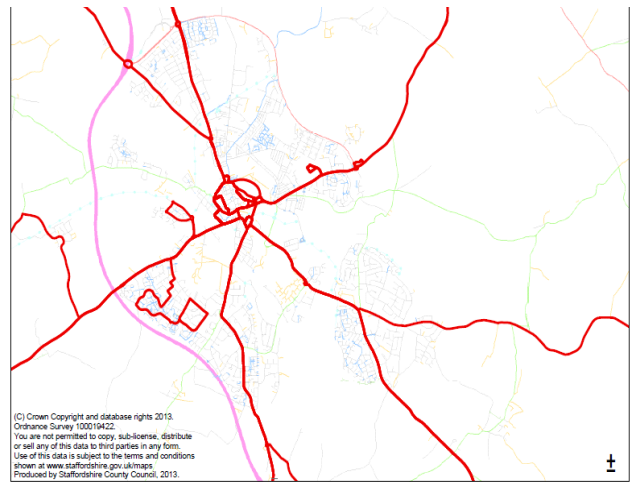
**Qualitative Statement**

Existing direct bus services which pass the rail station are:

9, 74, 75, 76, 88, 88A, 101, 481, 482, 825, 835, 836, 837, 490, X1

The routes are shown opposite.

All bus services pass through the city centre and so all buses are technically eligible for connecting to the train service. Therefore, all options are scored equally.



**Results**

Objective	Sub Objective	Options	
		Do Minimum	Do Something
Access to Public Transport	% of Development trips without access to bus within 400m	71.3%	10.2%

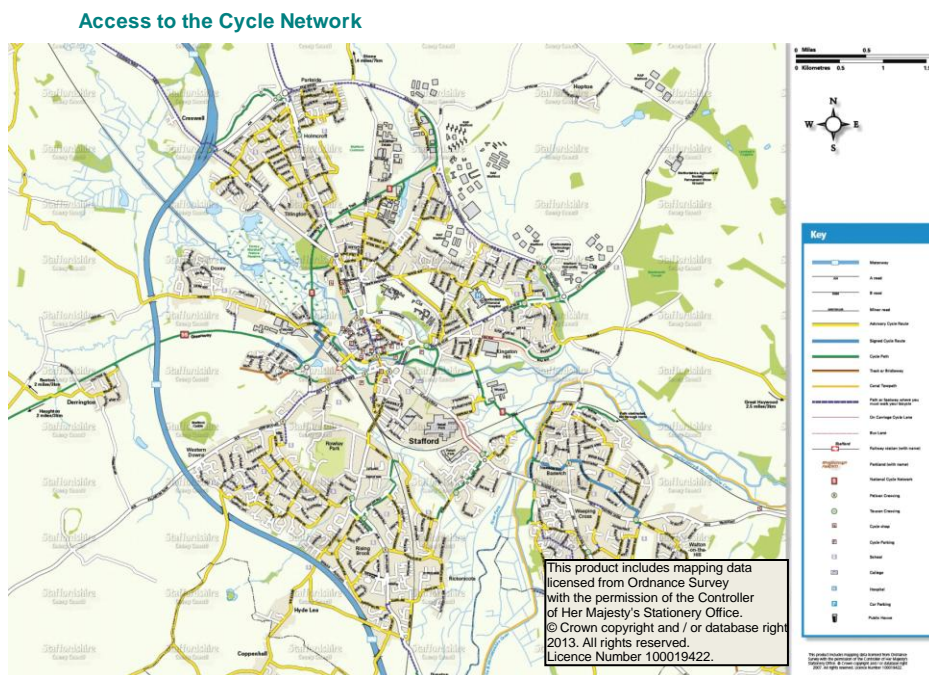
**Overall Score**

Objective	Sub Objective	Do Minimum	Do Something
Access to Public Transport	Bus	2	1
	Rail	1	1

**Objective:** Access to Non Motorised Modes

**Sub Objectives:** Access to existing Cycle Network

**Methodology**



Ref: Staffordshire CC Stafford Urban Cycling Map

**Key Points:**

In general, Stafford caters well for cyclists and other non-motorised users. The diagram shows a reasonably comprehensive cycle network.

**Within 15 minutes cycle of town centre**

This is tested by assuming that cyclists travel from each development at 16kph. The indicator assumes that the distance travelled to the town centre is 1.3 times the 'crow-fly' distance from the development to the centre.

**Results**

	Do Minimum		Do Something	
	AM	PM	AM	PM
% Developments within 15 minute cycle of town centre	44.2%		44.2%	

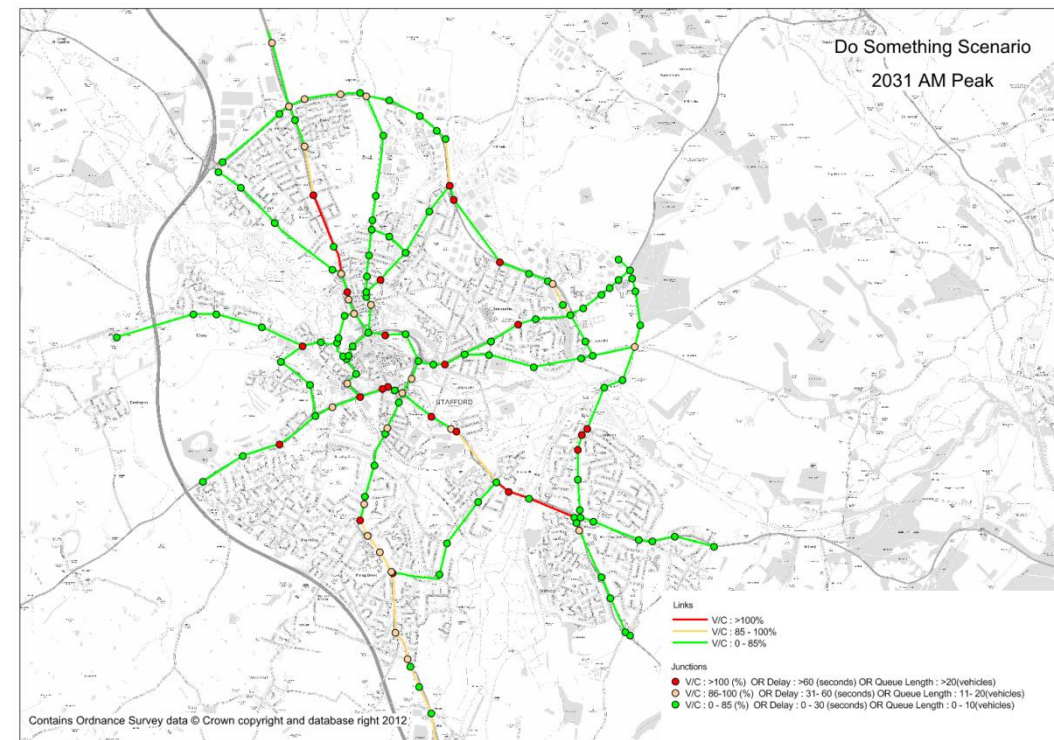
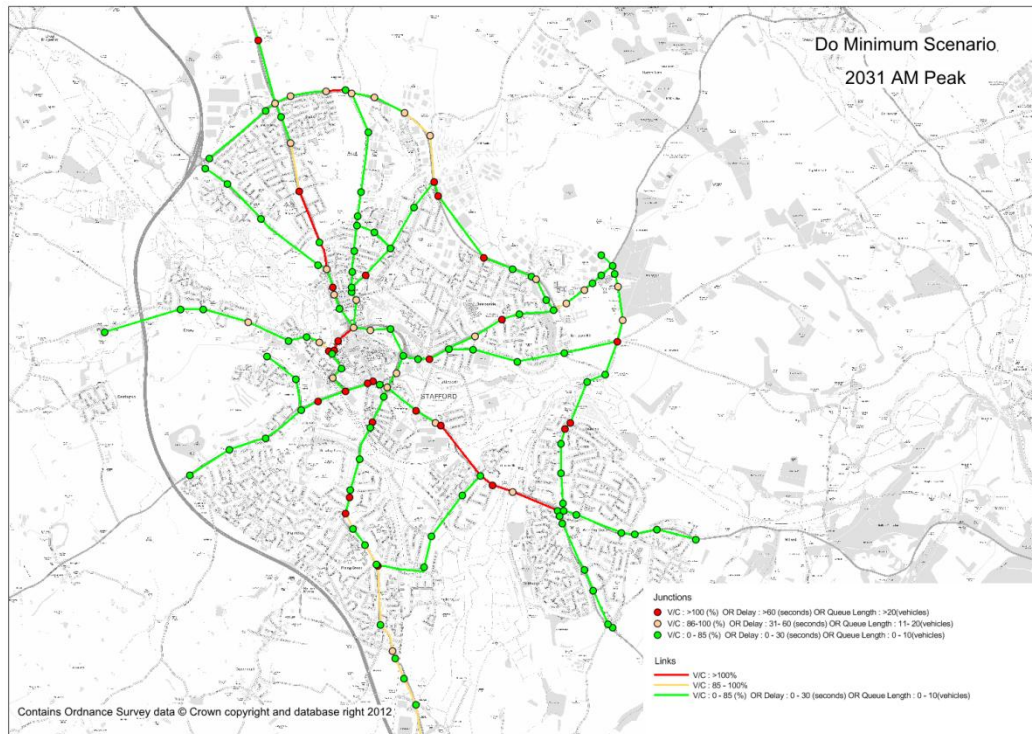
**Overall Score**

Objective	Sub Objective	Do Minimum	Do Something
Access to Non Motorised Modes	Access to Cycle Network	1	1
	Within 15 minutes cycle of town centre	1	1

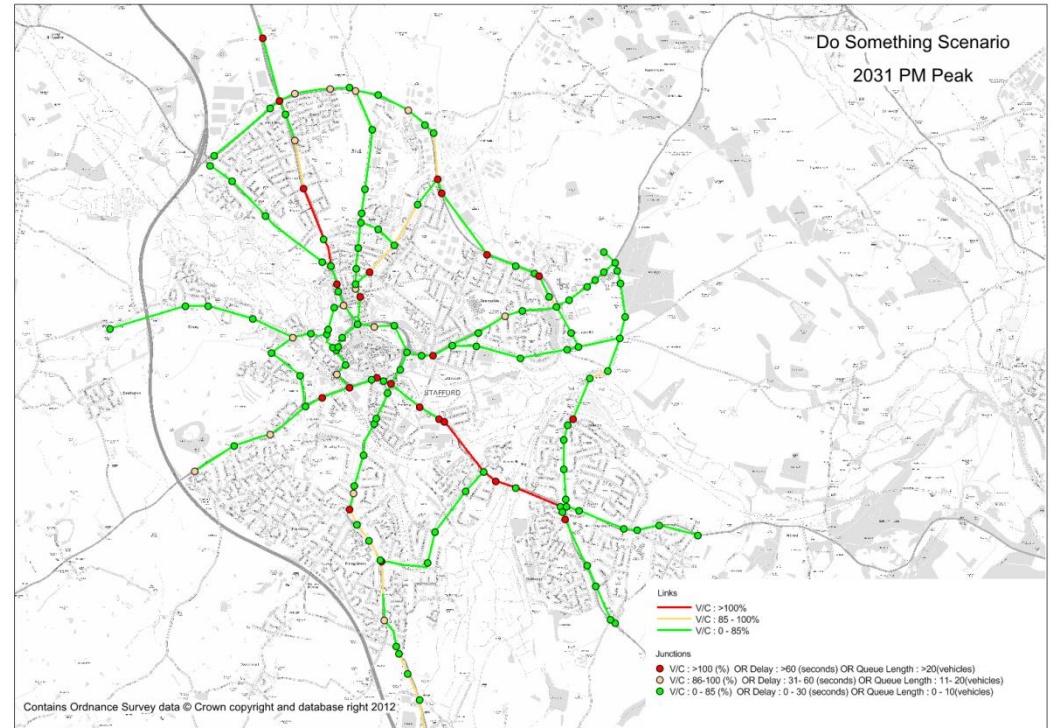
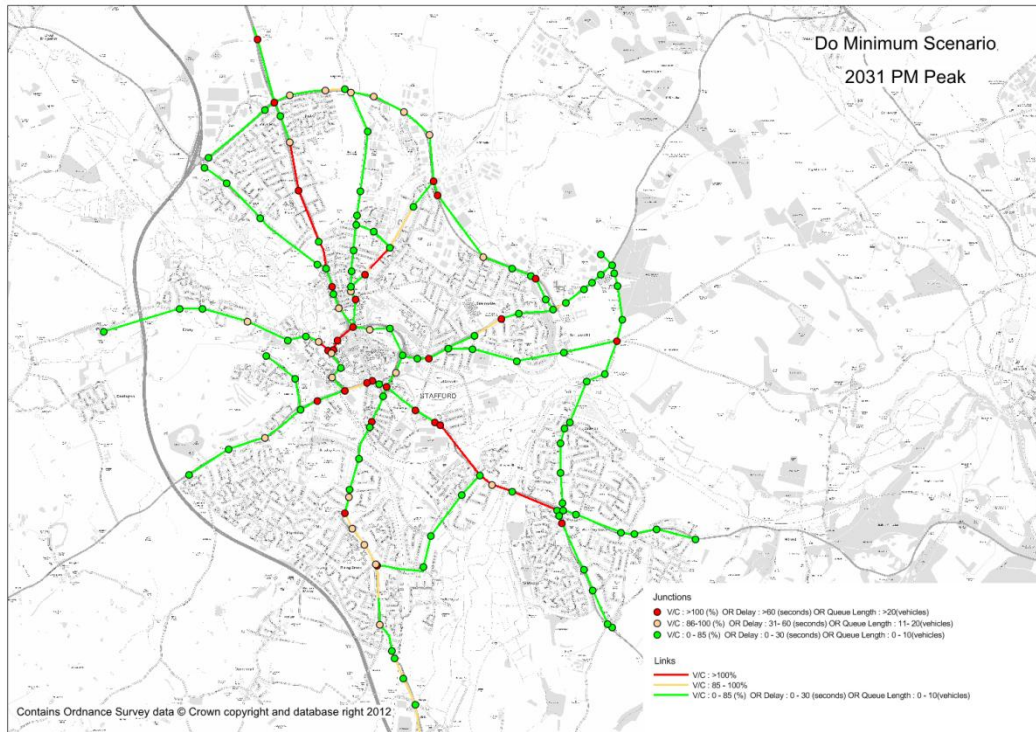
## Appendix B. Network Impacts



## B.1. Do Minimum and Do Something 2031 AM Peak: Network Impacts



## B.2. Do Minimum and Do Something 2031 PM Peak: Network Impacts



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