Bath & North East Somerset Council

Core Strategy: Transport Modelling Technical Note

Core Strategy Information Paper 4
January 2011

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Bath and North East Somerset
Local Development Framework

Core Strategy Transport Modelling Technical Note

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Background

Atkins was commissioned to undertake a series of strategic intervention tests as part of the transport modelling work to support preparation of the B&NES Core Strategy. The modelling work and its conclusions do not represent Council policy. This note summarises the work undertaken and its usefulness in informing the Core Strategy.

The work was undertaken using the GBATH and GBATS multi modal transport models, which were enhanced using updated survey information. GBATH is centred on Bath and GBATS is centred on Bristol.

Following consultation on the Core Strategy launch document and to support the Spatial Options document (published October 2009) initial model testing included two growth scenarios: 'A' based on RSS incorporating the Secretary of State's Proposed Changes (July 2008); and 'B' based on draft RSS levels of development. The Draft Core Strategy (published December 2010) plans for a revised locally evidenced level of development, referred to here as 'C'. Details of forecast dwellings and jobs under each scenario are provided in Table 1.

	A: Growth based on RSS Proposed Changes	B: Growth based on draft RSS (Core Strategy Spatial Options Document)	C: Growth set out in Draft Core Strategy (Publication Version)
New Dwellings	21,300	15,500	11,000
New Jobs	21,670	17,000	8,700

Table 1 Growth Scenarios to 2026

Scenarios A and B were tested at the future modelled year of 2031, which included the level of development proposed to 2026 plus annual growth to 2031, using TEMPRO 5.4.

Key features of scenarios A and B are set out in Table 2. Corresponding levels of growth in the rest of the West of England and adjoining authorities were included in both assessments. Further modelling work on Scenario C is now underway.

Urban Extensions

Urban extensions to south east Bristol and Bath were included in both growth scenarios A and B. As preparation of the Core Strategy progressed, scenario A was rejected. This reflected the Council's position on and representation made in response to the Secretary of State's Proposed Changes to RSS. The Core Strategy Spatial Options document was based on planning for the draft RSS level of growth. For Bath, transport modelling initially focused on a proposed urban extension at West of Twerton, which was the Council's preferred location. However, in order to provide a comparison with an alternative location, an urban extension at Odd Down (the second non-preferred option presented in the Core Strategy Spatial Options document) was tested under scenario B. This included two tests: 2,000 dwellings and an alternative lower level of development of 750 dwellings.

	Growth based on RSS Proposed Changes (A)	Growth based on draft RSS (Core Strategy Spatial Options Document) (B)	Growth set out in Draft Core Strategy (Publication Version) (C)
Bath Existing Urban Area	6,000 dwellings 11,017 jobs	5,000 dwellings 10,450 jobs	6,000 dwellings 5,700 jobs
Bath Proposed Urban Extension	2,000 dwellings (jobs included in Bath figure above)	2,000 dwellings (jobs included in Bath figure above)	0
Keynsham	1,500 dwellings 1,071 jobs	1,600 dwellings 2,100 jobs	1,500 dwellings 1,500 jobs
South East Bristol	8,000 dwellings 6,100 jobs	3,300 dwellings 1,500 jobs	0
Somer Valley	3,000 dwellings 2,045 jobs	1,700 dwellings 1,900 jobs	2,700 dwellings 1,000 jobs
Rural Areas	800 dwellings 1,437 jobs	1,900 dwellings 700 jobs	800 dwellings 500 jobs
Total	21,300 dwellings 21,670 jobs	15,500 dwellings 17,000 jobs*	11,000 dwellings 8,700 jobs

Table 2 Development Scenarios

*Note: 350 jobs unallocated to a specific location.

2031 Reference Case

A list of reference case transport schemes was agreed by the West of England Partnership and included in the 2031 future year. These schemes included:

- Greater Bristol Bus Network;
- Bath Transportation Package;
- Callington Link Road, Bristol;
- South Bristol Link Phase I & II; and
- Rapid Transit Line 3: Hengrove to Cribbs Causeway.

Modelling Results

The modelling results are reported in terms of transport mode choice and a series of highway and public transport indicators. Key output statistics for each test in GBATH are included in Table 3.

	Growth based on RSS Proposed Changes (A)		Growth based on draft RSS (Core Strategy Spatial Options Document) (B)			
Location of Urban Extension	West of Twerton	SE Bristol	West of Twerton	Odd Down		SE Bristol
Dwellings in Urban Extension	2000	8000	2000	2000	750	3,300
Traffic Growth 2006 to 2031	38%	38%	37%	37%	37%	37%
Public Transport Mode Share for Urban Extension	8.6%	16.1%	9.6%	10.2%	10.3%	15.1%
Change in highway network speeds #	-22%	-21%	-10%	-10%	-10%	-17%
Change in highway delay, pcu hours # (100% = double existing delay)	+104%	+174%	+101%	+102%	+99%	+164%

Table 3 Transport Summary Statistics, South West Bath & SE Bristol, 2031 AM Peak Hour

#: Relates to sector of model local to urban extension tested.

Table 3 indicates that the results for both growth options are similar. For Bath, an urban extension at Odd Down produced a greater proportion of public transport trips, reflecting the increased connectivity to the existing public transport network serving Bath. The congestion in south west Bath by 2031 is forecast to double under each scenario, with average network speeds predicted to decrease by 10% under scenario B. For South East Bristol, the options tested resulted in predicted delay increasing by a factor of 2.64 (+164%) with highway network speeds reducing by 17% with the draft RSS level of development (scenario B).

The reduction in trips on the highway network associated with reducing the level of development at the Odd Down site in Bath, is only around 0.1% of the total trips assigned to the highway network in the AM peak hour 2031 forecast year. As such, the relative impacts of the less-developed site tested are similar to those effects experienced for the full development.

Usefulness of results for Draft Core Strategy (Publication Version)

The Draft Core Strategy plans for a locally evidenced level of growth of 11,000 additional dwellings and 8,700 additional jobs net across the District. This means that urban

extensions are no longer planned for in the Core Strategy. Table 3 indicates that reducing an urban extension at Odd Down from 2,000 to 750 dwelling has little effect on the overall highway and public transport network performance. This is because an urban extension represents a very small proportion of total trips in the AM peak period (0.1-0.25% of trips in GBATH).

However, the change in forecast job levels is more significant. The proposed level of job growth for B&NES is now almost half the level applied in the draft RSS growth scenario (reduced from 17,000 to 8,700 net). This results in 4,750 fewer jobs in Bath, but is partially compensated by the corresponding reduction in housing growth (due to no urban extension). For example, a 2,000 dwelling urban extension could have provided approximately 2,200 new employees of which some 1,700 could have been expected to work in Bath if trends identified in the 2001 census are replicated. Therefore, the revised forecasts will lead to approximately 3,050 fewer commuting trips into Bath (including trips to P&R sites and public transport trips) which is approx. 10% of commuting trips from outside the City (2001 census levels). The proposed level of job growth in Bath is now more closely aligned with housing growth, such that significant increase in commuting from outside the city should be avoided.

Therefore, the effect of not planning for an urban extension to Bath is minimal, but the reduction in job growth is more significant, with approximately 3,050 fewer commuting trips. The draft RSS growth modelling tests are therefore likely to show higher levels of congestion and delay than will be experienced in the revised forecasts. However, the modelling results are still valuable in identifying potential problems of future development and represent a worst case scenario of future traffic conditions.

For South East Bristol, the modelling work to date indicates that the existing highway network in this area is more constrained than for Bath. The urban extensions tested were larger, but it appears that general traffic growth is having a greater effect on increasing delays and reducing journey times.

Atkins has been commissioned to update the GBATH model from version 2.3 to version 3. This update includes a range of technical improvements that will enhance the performance and reliability of the model, including a revision to traffic growth forecasts (using TEMPRO). This work is due to be complete by the end of January 2011. Atkins has also completed a Parking Cost Model for GBATH (covering Bath City zones) that improves model functionality and the ability to test options such as redeveloping some city centre car parks for other uses. The GBATS model has already been updated to version 3.

Further model testing is planned in early 2011 (with revised growth levels) to support submission of the Core Strategy, in Spring 2011, and provide evidence at the Examination in Public.

Core Strategy Transport Intervention Tests

Following the results of the 2031 reference case modelling, which showed increasing congestion on key routes, five potential transport schemes were shortlisted for testing within the 2031 GBATH and GBATS reference case models. Within GBATH, this work was undertaken using the West of Twerton option, since the tests were undertaken before the Odd Down option was included.

The schemes were:

- Whitchurch Park & Ride;
- Rapid Transit: Hengrove to Whitchurch Park & Ride;
- Rapid Transit: Bath city centre to Bristol city centre;
- A4-A37 Link; and

- A4 Saltford Bypass.

Table 4 provides the results of these option tests for the draft RSS growth scenario, in the form of key output statistics for sections of the modelled area within GBATH and GBATS (AM peak period).

Table 4 indicates the effectiveness of the options tested. The results are reported in sectors of the two models so that key changes can be identified. In summary, all options had a marginal effect on mode choice in the locality of the schemes. This was particularly disappointing for the public transport schemes. Further analysis was undertaken to investigate the Whitchurch P&R option and is summarised in the following section.

The highway schemes tested were shown to be more effective at improving network speeds and reducing delay in the locality of the schemes. The A4 Saltford bypass option was shown to be particularly effective. The A4-A37 Link produced more mixed results, with improvements in network speeds but an increase in overall delay in South Bristol and to a lesser extent, along the A4 corridor. The additional delay in South Bristol is caused by additional traffic attracted to the A37 preventing exit from side roads. It should be noted that whilst they were tested neither of these highway schemes is proposed in the draft Core Strategy.

Network Statistic	Modelled Area	Reference Case	Whitchurch P&R	Rapid Transit: Hengrove to Whitchurch P&R	Rapid Transit: Bath city centre to Bristol city centre	A4-A37 Link	A4 Saltford Bypass
Public transport mode share	Keynsham	10%	10.0%	10.0%	10.2%	9.7%	9.9%
	Whitchurch	15.1%	15.0%	15.7%	14.9%	14.1%	15.1%
	SW Bath	10.5%	-	-	-	10%	10.3%
Change in Network Speeds	SE Bristol		+1%	+1%	+1%	+16%	0%
	S Bristol		-2%	-2	-2%	+2%	0%
	SW Bath		-	-	-	0%	-1%
	A4 Corridor		-1%	-1%	+3%	+4%	+43%
Change in highway delay, pcu hours*.	SE Bristol		0%	-1%	0%	-5%	+1%
	S Bristol		0%	-1%	0%	+25%	-1%
	SW Bath		-	-	-	+1%	+4%
	A4 Corridor		+3%	+4%	-16%	+5%	-49%

Table 4 Transport Intervention Tests: Key Output Statistics, Draft RSS Growth AM Peak.

*Note: pcu hours = passenger car unit hours.

Whitchurch P&R

Modelling work undertaken by Atkins using the GBATS model indicated that Whitchurch P&R had no effect on total P&R demand, with 77 trips in the AM peak hour transferring from Brislington P&R. Extending the Bus Rapid Transit (BRT) to Whitchurch added an additional 60 trips in the AM peak hour. Additional work was undertaken by B&NES to verify the effect of the proposed Whitchurch P&R. This work used 2001 census data and is reported in Core Strategy Transport Modelling: Whitchurch Park & Ride Assessment; Technical Note; July 2010.

The 2001 census-based analysis indicated that the potential demand for P&R at Whitchurch is slightly higher than that predicted by GBATS modelling, with 164 work trips transferring to P&R in the AM peak hour at 2031. This is 21% of the estimated 0800-0900 northbound flow on the A37 at 2026 (based on 2009 flow of 697 vehicles).

However, the financial success of a P&R at Whitchurch would be impeded by the relatively long distance involved and congestion on the route. Additional bus priority would provide journey time savings, but it's unlikely to reduce the number of vehicles required (a 10 minute saving in the peak wouldn't affect the vehicle requirement).

A 6 vehicle service would cost approx. £600,000 pa to operate based on £100,000 per vehicle pa (single deck). This is 2.4 times the cost of operating vehicles at P&R sites in Bath. Such an operation would therefore be likely to require on-going subsidy until demand for the service covers the operating costs.

Extending the proposed Rapid Transit Line 3 to Whitchurch would be likely to be more efficient in revenue terms, since extra mileage is only required between Hengrove and Whitchurch. A direct route would require one or two additional BRT vehicles, depending on the proposed frequency. However, the capital costs of providing a dedicated off-line route would be considerable (approx. £23m, source: Summary of Scheme Costs, Mott MacDonald, June 2010). An on-highway service would be a lower cost option, but this would not deliver the same journey time savings.

This analysis suggests that a bus-based P&R option should not be pursued for Whitchurch, but a site served by an extended BRT (from Hengrove) could merit further investigation.

The public transport related measures tested are not proposed in the draft Core Strategy.

Bath Transport Interventions

Mott MacDonald was commissioned to examine the effect of various transport interventions within Bath using the GBATH model supplied by Atkins. This was based on the draft RSS level of growth with 7,500 new dwellings (1,500 in an urban extension) and 10,000 new jobs in the City.

Three packages of interventions were developed for testing:

- Public transport improvements with parking management;
- Smarter choices measures and walking/cycling improvements;
- Heavy goods vehicles (HGV) restrictions.

Public transport improvements with parking management:

Parking management was tested through a reduction in long stay car parking in the city centre, to further complement the Park & Ride improvements in the Bath Transportation Package, together with extensive improvements to the local bus services.

Parking management was shown to achieve a switch to Park & Ride. However, despite significant improvements to bus service frequencies, modelling suggests there would be a relatively small switch from car to bus. Overall, there would be about a 2% reduction in the number of cars travelling into the city centre as a result of the parking management and public transport package.

Smarter choices measures and walking / cycling improvements:

The 'smarter choices' test included workplace travel plans, school travel plans and personalised travel planning, aimed at encouraging a switch away from car. Walking and cycling improvements were included to target the relatively high number of short trips within Bath that are currently made by car. Such measures have proved successful in other cities in reducing the number of car trips.

The river corridor was identified as an area of the city which has the potential to switch short trips from car to walking and cycling. It is estimated that around 600 car trips could switch to walking, based on an assumed 25% increase in walking mode share for this area. The potential market for cycling is much larger, both in terms of geography and number of car trips, but the existing low cycle mode share (3.5%) means that even a 50% increase in cycling would only remove around 80 trips. Overall, these increases in cycling and walking would remove around 2% of the total Bath traffic in the AM peak hour.

Smarter Choices have the potential to reduce car trips by encouraging use of sustainable travel modes and reducing the need for travel altogether. A package of measures of Workplace and School Travel Plans and Personalised Travel Planning could reduce car trips by around 4%, or higher with suitable funding. The cumulative impact of walking/cycling improvements and Smarter Choices achieved a 6% reduction in AM peak hour trips.

Heavy Goods Vehicle restrictions:

The HGV restriction modelled was a hypothetical total ban on all HGVs over 7.5 tonnes travelling to, from or within Bath within the AM peak hour. An HGV ban will be difficult to implement and enforce in reality, but can offer benefits in respect of improved local traffic conditions (reduced congestion) with associated noise and air pollution reduction.

Bath Transport Interventions Summary

All of the packages were shown to reduce the predicted AM peak hour journey times into the city centre in 2031 by varying degrees, compared to the 2031 Reference Case with no interventions.

The combined 'smarter choices' measures, together with walking and cycling improvements, had the greatest impact of any single test on reducing the number of car journeys in the city. Modelling the 'smarter choices' measures shows that, in 2031, the maximum increase in journey times on 2006 levels was three minutes on most routes tested, with improvements on some. However, the modelling indicated an 8 minute increase on the route from the A4 west (towards an urban extension at West of Twerton, which was included in this test).

It is considered that these results are still valid with the revised draft Core Strategy levels of development, since the test results examine the relative benefits of each option, which are expected to be maintained with less development.

Summary

This note summarises the transport modelling work undertaken to assess the effect of development scenarios in Bath & North East Somerset to help inform the preparation of the Core Strategy. It also assesses the relevance and usefulness of this work with the levels of development set out in the draft Core Strategy (publication version). The key changes from the Spatial Options document include planning for lower levels of housing and job growth with no urban extension planned for Bath or South East Bristol. For Bath, the proposed urban extension accounted for just 0.25% of total trips in 2031. However, changes to the job forecasts are more significant, with a 49% reduction in total jobs now forecast within B&NES, compared to the draft RSS growth scenario. For South East Bristol, the modelling work indicates that general traffic growth alone is likely to cause significantly higher levels of delay. Despite these changes, the modelling results are still considered to have value, particularly the results of the various intervention tests. In terms of highway network speeds and delays the modelling work represents a worst case scenario for future development and general traffic growth.

References

1) B&NES Core Strategy, Stage 3 Scheme Intervention Testing: Higher Growth Scenario (Proposed changes to the Draft Regional Strategy) Atkins, November 2009.

2) B&NES Core Strategy, Stage 3b Scheme Intervention Testing: Lower Growth Scenario (Draft RSS), Atkins, November 2009.

3) B&NES Core Strategy, Stage 3c, Odd Down Development Testing, Atkins, May 2010.

4) Core Strategy Transport Modelling: Whitchurch Park & Ride Assessment; Technical Note, B&NES, July 2010.

5) Bath Transport Interventions Transport Modelling Report, Mott MacDonald, February 2010