Derby LTP3
Strategy Option Results Paper

July 2010

1 Introduction

1.1 Background

This working paper provides a summary of the modelling undertaken using the Derby Area Transport Model (DATM) to inform the development of a preferred long term transport strategy for the Derby LTP area over the 15 year period to 2026.

This paper should be read in conjunction with the Option Development Paper and Strategic Alternative Consultation document, which sets out the background and long term transport strategy option generation methodology.

The modelling results will be used in conjunction with the Strategic Environmental Assessment to understand the likely impacts of strategic transport options for Derby. The preferred long term transport strategy will set out future priorities for investment in transport and a short term plan of specific interventions covering the two year financial period between 2011/12 and 2012/13.

2 Broad Option Modelling

2.1 Spatial Assessment

DATM provides a tool to help analyse the current transport problems within Derby and predict the likely transport problems that we will face in the future, as a result of economic and land use growth and changing travel patterns. It can predict the possible impacts of transport options and strategies providing a range of statistics and outputs that can be fed into economic, accident and environmental appraisal models.

For the purpose of analysing issues, particularly using DATM, and the design of solutions the corridors are grouped into sectors. Corridors are grouped together where they have a particular interrelationship. For example, the A61 and A52 Nottingham Road are interlinked by the Pentagon Island, which controls both through traffic and city centre traffic on both corridors. The combination of natural barriers such as the River Derwent and transport barriers such as railway lines tend to define the corridor catchment.

The corridors and sectors are:

North East	1. 2.	A61 Sir Frank Whittle Road A52 Nottingham Road
South East	3. 4.	A6 London Road A514 Osmaston Road
South West	5. 6.	Stenson Road and Sinfin Lane A516 Uttoxeter Road and A5250 Burton Road
North West	7. 8.	A52 Ashbourne Road A6 Duffield Road and Kedleston Road
City Centre	9.	Derby city centre

Figure 2.1 provides a thematic plan of Derby and shows each of the corridors and sectors following the numbered list above.

2.2 Option Tests

Following our initial assessment of transport options, which ruled out a number of schemes for inclusion in the long term transport strategy, we identified a 'short list' of transport measures that could be tested using DATM. The short list of measures were tested individually to determine which performed best in addressing the goals and challenges of LTP3.

Not every strategy option can be directly modelled using the Derby Area Transport Model. This is because not all options can be represented within a strategic transport model or would provide tangible results. For example, network management options such as Freight

Quality Partnerships or Street Work Permit Scheme. There are benefits of including these options in the Longer Term Transport Strategy but the justification is based on current evidence and wider benefits that cannot be quantified by the model.

In total, eleven broad option tests were undertaken using DATM and the forecast 2026 scenario.

1a	Reduction in Public Long Stay Parking in City Centre tested incrementally for example 40% reduction. The parking will be converted to short stay parking.
1b	Increase City Centre Long Stay parking charges tested incrementally 20% and 40% increase.
2	Integrated smart card bus ticketing.
3	Increased Bus frequency on all urban services with less than a 10 minute headway during peaks. Inter urban services half hourly in the peak and hourly off peak. Orbital bus service operating on outer ring road linking with employment sites and residential areas.
4	Measures to encourage walking and cycling.
5,6,7,8	Smarter choices, public transport and traffic management Improvements across North West, North East, South East and South West Sectors of the City
	High investment in Smarter Choices Investment in bus priority and traffic and network management improvements Investment park and ride sites on strategic radial corridors to the City Centre
9	Closure of London Road Bridge
10	Introduction of residential 20 mph zones using two discreet residential areas as an example.
11	Network Wide Urban Traffic Control, such as Scoot, MOVA and CCTV.

The options were either modelled on an individual basis across the whole network or together incrementally across the different sectors and corridors of the city as set out in **Figure 2.1**.

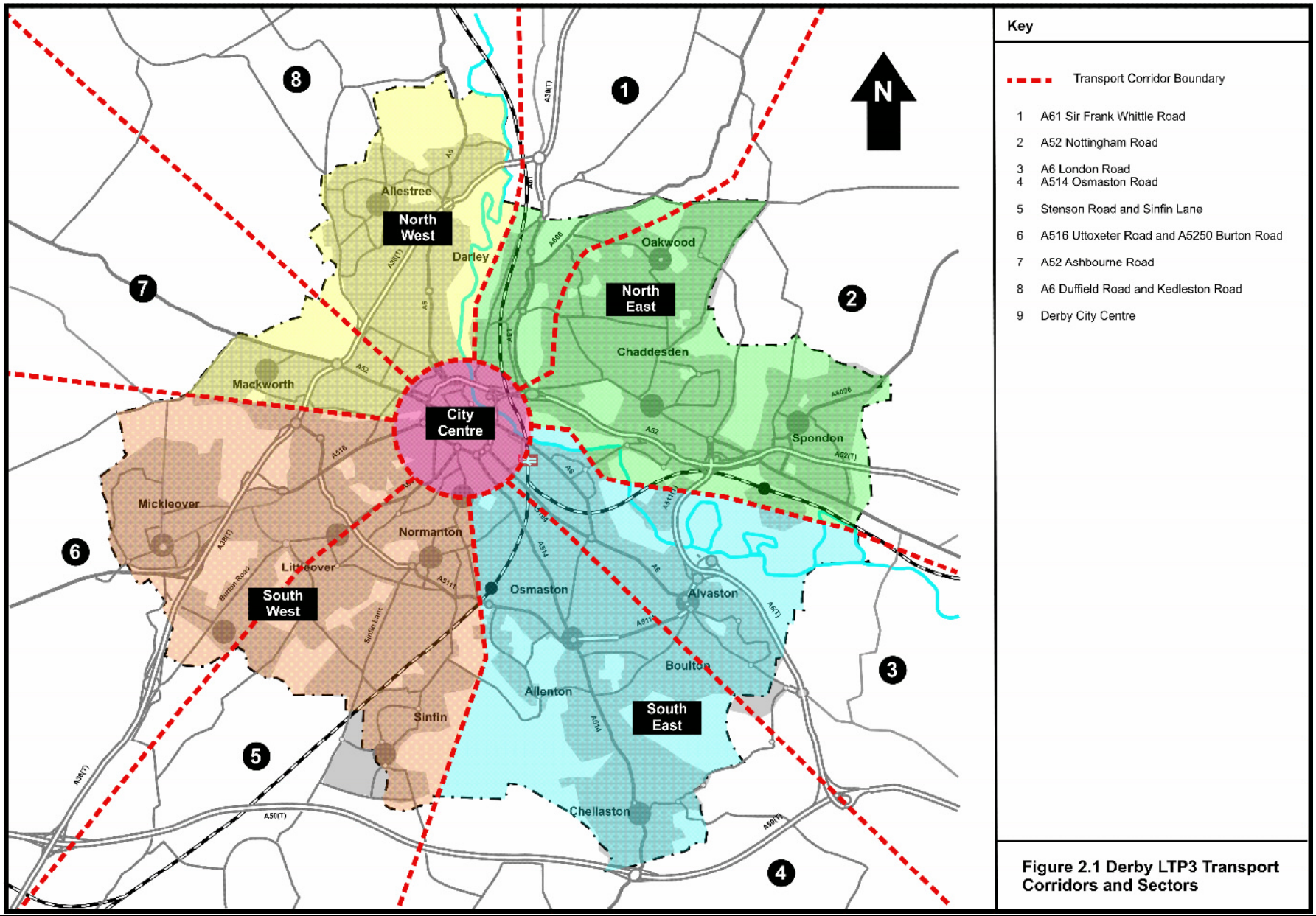

Figure 2.1 Derby LTP3 Transport Corridors and Sectors

The reason for modelling options on a corridor and sector basis is that some options, specifically bus priority improvements, park and ride, network management and smarter choices, are interrelated in terms of their benefits and dis-benefits.

The other main motive for modelling options on a corridor and sector basis is that the benefits and dis-benefits will be different across Derby depending on the existing transport network and demand for travel. This will provide an understanding of how similar options perform on a corridor basis and help in the prioritisation of the implementation plan.

2.3 Appraisal Indicators

The Guidance on Local Transport Plans 2009, provides clear advice on the appraisal of transport options. Further detailed guidance is provided on the Government's web based Transport Assessment Guidance Web TAG, although with a new national Government this has currently been suspended.

Guidance states that authorities should consider appropriate and proportionate methods of appraising identified options. An appraisal of transport options, their costs and benefits and value for money will help prioritise the measures to be included in the LTP. It is important that the appraisal measures changes in greenhouse gas emissions and air quality impacts.

The strategy options cover a wide range of interventions and as such necessitate broad indicators to tests impacts against goals and challenges of LTP3. For the initial testing of options these will be:

- **Economy** – changes in average network speeds, delays (overall and per KM), flow/capacity ratios (overall and per KM), total trips and trip lengths.

  TUBA was used to appraise the economic user benefits based on the 2026 model outputs. These do not include the construction or implementation costs of schemes but do consider operating costs (fuel) and revenue.

  In addition, changes in the number of commuter trips to the city centre.

- **Accessibility** – Identify changes in modal share and changes in the types of trips that cross the Inner Ring Road and Outer Ring Road.

- **Safety** – application of standard accident rates and monetary values to forecast changes in vehicle kilometres on highway links within the LTP area. This assessment will be undertaken using COBA.
- **Environmental** – changes in emissions including CO_2, NOx, PM_{10}, and CO at the roadside as a result of changes in speeds and flows.

3 Option Test Results

Each of the option tests is discussed in the proceding paragraphs and a summary table of each is presented giving an indication of the level of benefits or dis-benfits against each of the broad indicators.

3.1 Reduction in Public Long Stay Parking in City Centre

This test considered reducing the number of long stay parking spaces in the city centre. The objective of the test was to establish the impact of changing the level of long stay parking on commuter trips to the city centre and the impact of reallocation of these long stay spaces to short stay parking.

In total there are around 2000 long stay spaces in the city centre of which around half the City Council Control. Other Long Stay car parks include NCP and smaller private car parks that offer public parking. The test only considered changes to Council car parks because the other long stay parking is outside of our control. In addition, there are also around 2000 private non residential (PNR) car parking spaces in the city centre that are associated with employment.

The parking supply within the DATM model takes inputs of the number of parking spaces and parking charges in each model zone for each of the parking types in the model. It is important to note that each of the charges and spaces is given separately by zone and parking type. The model contains the following parking types:

- Private Non Residential parking.
- Off Street Short Stay parking.
- Off Street Long Stay parking.
- On Street Paid parking.
- On Street Free parking.

The test assumptions considered reducing DCC controlled long stay parking by 40%, converting these spaces to short stay parking. The key points were derived from the model are summarised below.

Economy	There is a slight increase in delays in the AM Peak, probably as a result of cars driving around trying to find a parking space. There is an increase in short stay parking in the Inter Peak and PM Peak but delays decrease during these time periods by -3.4%. The availability of short stay parking is reducing the circulation of traffic in the City Centre making it more efficient to find a space. Very little change in mode share or commuter trips suggesting that the removal of long stay parking spaces does not discourage car commuter trips.	✗
	Overall negative user benefits of -£694,000 per annum.	
Accessibility	Overall slight increase in car trips to city centre as a result of more short stay parking Little change in mode share or numbers of trips moving across-	-

	the two ring road cordons	-
	Negligible increase in park and ride usage	
Safety	No significant changes	**-**
Environment	Slight improvements in environmental indicators (-1.0% in CO)	✓

In summary, reducing long stay parking spaces and converting them to short stay spaces has very little impact overall. Delays in the AM Peak increase and there is no significant change in commuter trips for car mode. This suggests that commuter car trips are still being made to the city centre and that they are parking else where, probably on street or within other private off street car parking. The delays could be a result of cars searching for alternative parking.

Any policy to remove long stay car parking spaces would need to be tied in with providing alternatives for commuters such as public transport or alternative parking away from the city centre such as park and ride. In addition, any policy to reduce long stay car parking spaces is undermined by the amount of private public long stay and private non-residential parking in the city centre. This is currently exacerbated by the amount of temporary cheap parking on land that is waiting to be developed.

3.2 Increase City Centre Long Stay Parking Charges

The test considered increasing parking charges across all Council and privately managed car parks in the city centre by 20% and 40%. The objective of this test is to establish the impact of changing the level of long stay parking pricing on commuter trips to the city centre.

Generally, private parking costs are similar to those set by Derby City Council or will follow the same level of increases set by the authority. The private car parking charges are weighted so that more money can be made from short stay parking. The model runs show that there is a demand for short stay parking. It is likely that private car parks would adjust their long stay costs to maximise revenue. However, there will be a tipping point where losses in long stay parking revenue will not be backfilled by short stay demand.

Long stay parking is generally defined as any occupancy of a space over 4 hours. The test considers increasing charges for all long stay parking only. The key points were derived from the model results for 20% increase test.

Economy	Reduction in overall delays in highway network across the day (-5.4%), not so significant in AM Peak.	✓✓
	Overall positive user benefits, however, benefits from reduced delays are eroded by car parking costs to users. Conversely, these costs are a revenue gain to the car park operators.	
Accessibility	Slight decrease in car trips to city centre, reduction in overall attractiveness of city centre by public transport.	✗
	Increase in short stay parking in city centre outside of AM Peak is causes delays to buses	
Safety	No significant change in accidents	-
Environment	Improvement in environmental indicators (-1.8% in CO)	✓

The key points were derived from the model results for 40% increase test.

Economy	Reduction in overall delays in highway network (-1% AM Peak to 4.8% in PM Peak).	✓✓
	Overall positive user benefits (£1,015,000 per annum) mainly from benefits derived from reduced delays.	
Accessibility	Slight decrease in car trips to city centre, reduction in overall attractiveness of city centre by public transport.	✗
	Increase in short stay parking in city centre outside of AM Peak causes delays to buses	
Safety	No significant change in accidents	-
Environment	Improvement in environmental indicators (-1.5% in CO)	✓

The test results show that increasing parking charges decreases the attractiveness of long stay parking. This has a benefit over the whole day of reducing delays across the network as a result of the removal of trips. This is spread across the PM and Inter-peak as the return journey is less constrained.

However, the converse impact is that there are more spaces available for short stay trips, as a number of short stay journeys can use the same space as one long stay journey. This has two impacts; the first is that trips from public transport are attracted to use the car. Secondly, although overall there is a reduction in highway delays the city centre becomes busier increasing delays for buses outside of the AM Peak. Small changes in the operation of the city centre network are magnified because of the concentration of buses.

In summary, there are benefits in terms of reducing congestion in the AM peak and there is a slight decrease in commuter car trips suggesting that increasing parking charges is having the desired effect. The increase in short stay parking activity encourages mode shift from public transport in the inter peak and increases delays to buses in the city centre. The fact that short stay parking increases in the inter-peak suggests that there is demand for it. Therefore, there is potential for increasing short stay parking charges, however, pushing parking prices up too far will push trips away from Derby and the 40% increase in charges test starts to show this.

Any policy to change parking charging relies on the ability to influence private parking charges. These are normally slightly lower than public parking charges but generally follow changes to public parking tariffs. The current problem for Derby is the amount of cheap temporary parking that has appeared on land that is waiting to be developed. This is around half the cost of long stay public and NCP parking. Regulating the pricing (long and short stay) could be an effective measure for reducing congestion in the peak hours on the approach to the city centre.

3.3 Integrated bus ticketing.

The objective of this test was to establish the impact of integrated ticketing in reducing bus dwell times at stops, thereby maximising efficient journey times for bus operators and users.

Research has been carried out for a £4.00 integrated ticket for Derby which is now close to implementation with an actual ticket price of £4.50 for Derby and the housing adjacent to the city boundary in South Derbyshire. However; given the current availability of day tickets in Derby it is thought that the proposed scheme will only have a limited impact on the demand for travel by bus because most people will either not be interested in a day ticket - as they

have a longer period pass or are paying concessionary fares, or are already using a one day ticket. A smart card scheme, similar to the Oyster card available in London, could have a wider impact. Smart cards have benefits as public transport users can travel with different public transport operators without financial penalty and they are easy, convenient, quick and cashless .

In order to carry out the test MVA made informed assumptions about the level of benefit that will result from such a scheme, both in terms of journey time and bus fare savings. MVA drew on knowledge of the benefits of other ticketing schemes they have modelled and developed for other studies, and in particular the implementation of smart cards.

The specification for the test considered the following:

- modelling of a 5% reduction in bus journey time in TRAM, by increasing bus speeds through the bus speed factor;
- modelling of reduction in cost of interchanges by halving the boarding fare for interchanges;
- modelling of 5% reduction in average fare per journey by reducing bus fares; and
- modelling a change in the relative attractiveness of buses through a 5% reduction in the in-vehicle time factor.

The test covers the DATM area rather than a city wide scheme.

Economy	Surprisingly the number of commute public transport trips into the city centre decrease by - 3.5% probably because an integrated ticket makes the wider PT network more attractive. This may be as a result of new trip opportunities reducing the capacity of buses that city centre commuters use.	
	However, there is very little change in the number of commuter car trips to/from and within the city centre.	✓
	There is a slight increase on total delay/ vehicle km delay in the am peak of 1.2% with a reduction in delays in the inter peak of -5% and in the pm peak of -3.3%. Across the whole day delays are decreased by -2.6%. There is little change in the number of car trips across the whole day as the parking made available attracts new trips.	✓ -
Accessibility	There is a slight increase in city centre public transport trips of 1% and a slight increase in walking and cycling trips of 0.2% with a slight shift away from the car of -0.1%.	✓

	There is a significant impact on each of the existing park and ride sites with a reduction in use of -12% of the A61 and -10% in the Hospital site.	
Safety	No significant change in accidents	-
Environment	There is a slight improvement in environmental indicators of -0.8% CO	✓

A proposed integrated ticketing scheme has been modelled for the whole DATM area and the results show that overall it marginally increases bus usage. Again, as a stand alone scheme the benefits are undermined by the availability of short stay City Centre parking. It could also be concluded that in order to secure some of the delay-related benefits integrated ticketing could achieve, this measure would need to be combined with measures to make parking in the city centre less attractive and that an integrated ticket scheme would support measures to improve bus services.

3.4 Bus Service Improvements

This test looked at the impact of increasing bus frequency on all urban services with less than a 10 minute headway during peaks and a minimum frequency for inter urban services of half hourly in the peak and hourly off peak. A proposed orbital service operating on the outer ring road was included in the test.

Economy	There is a slight decrease in delays across the am, pm and inter peak. The reduction is only slight because the number of trips into the city centre increase overall .There is a significant increase in commute trips to the city centre by public transport of 7.9%, which outweighs a negligible decrease in car trips and walking and cycling trips.	✓
	There is a negative impact on highway net user benefits of -£1,937,000 but this is offset by the public transport net user benefits of £8,873,000 giving an overall net benefit minus costs of £2,385,000.	
Accessibility	There is a significant increase in the number of public transport trips to/from and within the city centre of 5.8%. There is a significant 279% increase in use of the Pride Park park and ride site because the bus service serving the site has had its frequency increased as part of the test - showing that the attractiveness of the park and ride site is clearly related to the frequency of the bus service that serves it.	✓✓
Safety	No significant change in accidents	-
Environment	There is a slight improvement in the environmental indicators with a reduction of 1.1% Carbon Monoxide (CO).	✓

In summary, the significant increase in public transport trips abstracts from walking and cycling and has little impact on car trips, it can be assumed that again the parking that is made available attracts new car trips – overall the number of trips for the commute increase slightly. Any benefits that could be achieved through bus service enhancements would need to be 'locked in'. There are few practical and affordable opportunities for the city council to influence bus frequencies; however, by influencing demand by managing car travel, bus

operators would then potentially accommodate the increased demand by increasing capacity or frequency of services.

It can also be concluded that an orbital bus route that covers the whole city would not be sustainable and that it would be more prudent to concentrate resources on the radial routes into the city centre and complement the occasions where passengers need to use different bus routes with an integrated ticket scheme.

The test shows that if you increase the frequency of bus services that passenger demand increases. In reality, bus services in Derby are run by private operators who run services on a commercial basis and are unlikely to increase the frequency without subsidy from the City Council. Considering the economic pressures that national and local government are facing this is unlikely to happen. However, increasing bus frequency has to be a long term strategy aspiration because the intervention reduces congestion and improves accessibility. The growth in demand as a result of other interventions will increase patronage and the commercial viability of increasing the frequency of services.

3.5 Measures to encourage walking and cycling.

This test looked at high levels of investment in cycling and walking measures that would provide a generalised journey time cost saving of 10 minutes for cycling and 2 minutes for walking journeys, by providing new walking and cycle infrastructure. These values were based on work carried out previously for Greater Manchester Passenger Transport Executive (GMPTE), and represents a well funded package and are intended to represent the impact of significant investment.

The specification for this test considered the trips that are likely to be affected by the strategy, and therefore only applies reductions in travel times to certain origin and destination combinations. The trips considered were as follows:

- improvements to walking and cycling routes within the City Centre;
- improvements to walking and cycling routes for accessing the City Centre; and
- improvements along specific corridors, such as a dedicated cycle route along the Mickleover Mackworth disused rail line.

It is worth noting that the walk and cycle trips in the model are based on synthesised demand, so the percentage increases may be a more suitable guide to the potential for increasing walk and cycle trips.

Economy	The number of commute walking and cycling trips increases significantly by 36%. However, some of this increase is from trips attracted away from public transport, which reduces by -1.6%. The significant increase is on a comparatively low mode share and represents an increase of 800 trips. Despite the slight transfer of commute trips from the car (-1%) to walking and cycling there is a slight increase in delays in the am peak, a significant increase in the pm inter peak delays (9%) and a significant decrease in the pm peak (-5.5%). The slight decrease in commuter car trips frees up parking spaces to be used throughout the day indicating that these spaces will be used more often and for shorter stays with drivers opting to leave before the pm peak traffic.	✓

	Burton Road/Uttoxeter Road corridor shows some of the largest increases in cycling. This is related to the Mick/Mack cycle and footway dedicated link and shows the benefits of this type of scheme.	
Accessibility	The number of walking and cycling trips increase significantly by 52.9%; however, this is from a low base and actually represents an increase of approx 6,000 new trips to/from and within the city centre. There is a decrease of 1.2% in public transport trips as trips are abstracted from this mode. There is an increase of 3.7% in car trips to, from and within the city centre throughout the day – this increase in accessibility for the car is for the reasons described above: parking spaces freed by commuter use will be used for shorter stays, more often during the day.	✓✓
Safety	The creation of a segregated cycle and pedestrian route along the Mick/Mack disused rail line will have positive safety benefits which are not modelled in this test.	✓
Environment	There is a worsening of all the environmental indicators with Carbon Monoxide (CO) worsening by 3.5%. However, this is not directly to do with cycling and walking but the freeing up of car parking in the inter peaks leading to more car trips.	-

The test has shown that the increase in walking and cycling leads to an increase in delay, most significantly in the inter peak, once again the parking spaces freed by the car drivers shifting to walking and cycling are used for shorter periods and more often during the day. The walking and cycling test is not able to bring out benefits associated with walking and cycling such as health improvements and better sense of place.

The results for walking and cycling should not be taken as absolute numbers. There is not a significant amount of research in terms of how improving facilities is related to mode shift, and modelling this by changing generalised costs of travel. The test provides an idea of what happens when you make walking and cycling more attractive and how this relates to mode share between the main transport corridors. Indeed, the greatest changes were predicted to occur on Burton Road and Uttoxeter Road, Duffield Road, Sinfin Lane and Stenson Road. In part some of these changes is a result of the implementation of an off road cycle link along the Mick Mack route.

In terms of the overall results for this intervention, again the issue with walking and cycling is that it reduces car commuter trips, which in turn frees up car parking spaces in the City Centre in the Inter Peak for short stay parking. This negates the benefits generated in the AM Peak.

3.6 Smarter Choices Sector Tests

The modelling of smarter choices has been achieved in other models and studies through a reduction in the generalised cost[1] of travel by modes such as public transport and walking

1 Generalised cost is the sum of the monetary and non-monetary costs of a journey - Monetary (or "out-of-pocket") costs might include a fare on a public transport journey, or the costs of fuel, wear and tear and any parking charge, toll or congestion charge on a car journey. Non-monetary costs refer to the time spent undertaking the journey. Time is converted to a money value using a value of time figure, which usually varies according to the traveller's income and the purpose of the trip. The generalised cost is equivalent to the price of the good in supply and demand theory, and so demand for journeys can be related to the generalised cost of those journeys using the price elasticity of demand.

and cycling. This method was applied to DATM on an individual sector basis by targeting origins and destinations to the City Centre where measures to encourage these smarter choices are most likely to succeed.

Evidence from major studies, such as East Midlands TIF and Greater Manchester TIF, were used to define a suitable level of generalised cost reduction. This test methodology provides a means of understanding the impacts that smarter choices may have across different sectors of the City. The success of smarter choices is not only is a product of the transport system but also peoples travel habits and social economic background.

In order to allow a comparison of the impact of smarter choices on the different sectors, the

same value has been used to represent the impact of smarter choices in each test. The values that have been applied are:

- a reduction in the generalised cost of a one-way public transport journey of 5 minutes; and
- a reduction in the generalised cost of a one-way walk/cycle journey of 5 minutes.

The key points derived from the testing are summarised in the table below for all of the sectors.

Economy	Not much overall impact on reducing car commuter trips. Overall increase in delays across the day as a result of	Neutral
	Overall positive user benefits (£2,359,000 per annum). However, benefits from reduced delays are eroded by car parking costs to users.	
Accessibility	Increase in the total trips to the City Centre with 2.7% in South East Sector and 3.4% in South West Sector	✓
Safety	No significant change in accidents	Neutral
Environment	No significant change in environmental indicators	Neutral

Overall the smarter choices test shows that there is little change in car commuter trips as a result of the changes in generalised costs applied to the model. However, there is an increase in total trips to the City Centre particularly by walking and cycling and public transport. Compared to the walking and cycling test the changes in generalised costs in this test were less. This perhaps indicates that significant changes would need to be made in terms of journey time to produce a change in trips from the car. The results are not conclusive and they perhaps show the difficulty in trying to model something where the benefits and peoples willingness to change travel habits is based on more than costs. In addition, Derby is different to larger urban areas where delays and congestion are greater and so the elasticity to change is likely to be different.

It is difficult to model unsupported assumptions of the likely changes that smarter choices will have on an area. Indeed, there are a number of different measures that could be introduced to Derby from Personalised Travel Planning to Car Clubs. These have all had varying degrees of success depending on the level of investment and particular town or city. However, the results did show that the growth in public transport and walking and cycling were greatest in the South West and South East Sectors of the City.

Some tests such as the integrated smart card ticketing, walking and cycling would need some level of smarter choices to succeed and so the benefits of smarter choices have already been partially taken into account in the modelling. As such, the modelling of the preferred package needs to be undertaken in such a way that the benefits of smarter choices are not double counted.

The conclusion from a number of studies, including the 6c's Congestion Management Study, is that any measure that reduces traffic congestion has the potential to enable traffic to move faster, and therefore can induce more traffic, which will reduce the benefits. In other words without some form of demand management the benefits will not be realised.

3.7 Bus Priority and Traffic Management Sector Tests

The feasibility schemes that have been developed as part of the Strategic Integrated Transport Strategies for the corridors across the City were input into the model. Although, there are detailed issues with some of the proposals that have been developed, the schemes represent the best knowledge that we have in terms of what is physically possible and what provides value for money in terms of their costs and benefits. Traffic management schemes and bus priority were modelled together because the two types of interventions are interrelated, particularly for public transport.

The results across the four sectors is summarised in the table below.

Economy	Generally there is little impact on delays for general traffic. However, this is because the routes are becoming more efficient reducing reassignment and distribution of effects.	✓
	There are both positive benefits for highway users and bus users and general net benefits of between £1.4 million on the South East Sector (London Road and Osmaston Road) and £6.7 million on South West Sector (Burton Road and Uttoxeter road).	
Accessibility	Overall there is little impact on trips to and from the City Centre across the day, although in general public transport trips increase by around 1%.	✓
Safety	No significant change in accidents	Neutral
Environment	Little change in environmental indicators	Neutral

Overall bus priority and traffic management improvements have a positive benefit on general travel. They provide both improvements for traffic in terms of better traffic management and bus priority as a result of bus lanes and priority at traffic signals.

3.8 Park and Ride Sectors Tests

The following park-and-ride schemes will be coded into the model, with the coding being defined following a review of available information on previous work.

- An A61 park-and-ride site location adjacent to the A38 junction at Abbey Hill, with a bus service operating at a 10-minute frequency during the daytime along the A61. A charge of £2.20 per day will be made for using the site. A 420 space car park would be provided. The Park and Ride is 3.2 miles from the City Centre.

- A park-and-ride site located at Megaloughton Lane, with a bus service operating at a 10- minute frequency during the daytime along the A52. A charge of £2.20 per day will be made for using the site. A 617 space car park would be provided. The Park and Ride is 3.3 miles from the City Centre.

- A park-and-ride site located at the A6 Shardlow Roundabout, with a bus service operating at a 10-minute frequency during the daytime along London Road and Shardlow Road. A charge of £2.20 will be made for using the site and a 700 space car park will be provided. The Park and Ride is 5.3 miles from the City Centre.

- A park-and-ride site located on the Uttoxeter Road corridor at the Manor Kingsway hospital site, with a bus service operating at a 10-minute frequency during the daytime. A charge of £2.20 will be made for using the site and a 900 space car park will be provided. The Park and Ride is 1.6 miles from the City Centre.

Although the park and rides have been specified in the test, this has only been used as a geographical example on each of the corridors. The optimum location needs to be established as part of detailed design study.

Previous work on the interaction of catchment areas between park and ride sites was used to assist in the definition of catchment areas for this site. The park and ride tests were undertaken with bus priority, traffic management and smarter choices in place. It was assumed that park and ride could not be delivered without some form of improvements to bus reliability on the appropriate corridors or some form of branding and marketing.

The key points derived from the testing are summarised in the table below for all of the sectors.

Economy	Reduction in overall delays in highway network across the peaks, on average around 2% in AM and PM. The most significant impacts are in the South West Sector (Uttoxeter Road Corridor) and North East Corridor (A61 and A52 Corridors).	✓✓
	Overall positive user benefits on average around £4 million. Slight reduction in car commute trips to City Centre and increase in bus trips of around 7% on average.	
Accessibility	Slight decrease in car trips to City Centre but increase in public transport trips of 6%. Overall increase in trips to City Centre of 1.6% across the day.	✓
Safety	No significant change in accidents	Neutral
Environment	No significant change in the indicators	Neutral

The park and ride tests were undertake with bus priority and traffic management in place because it was assumed that they would not be implemented without these measures. The benefits of traffic management and bus priority tests were abstracted from the overall benefits of the Park and Ride test to isolate the benefits of Park and Ride alone.

Generally the Park and Ride schemes all provide positive results. The Uttoxeter Road, Boulton Moor and A52 Park and Ride sites were all fully utilised. However, the A61 park and ride did not operate at full capacity and was less than 50% full.

The Park and Rides reduced both delays across the peaks and increased bus patronage into the City Centre. The important issue is that City Centre trips across the day increased slightly indicating that there was no detriment to the attractiveness of the City Centre.

3.9 London Road Bridge

In the development of the 2016 and 2026 Reference Case scenarios it was assumed that London Road Bridge would deteriorate to single way working and then full closure by 2026. However, this would undermine any improvement options to the corridor and as such for the basis of testing the benefits of other interventions it was assumed to be open.

As such, a separate reference case was developed with the bridge open. A summary of the test results below compares the bridge open to the reference case where it is closed.

Economy	With the closure of the bridge overall delays in highway network of -increase by 1% in AM Peak.	✗✗
	Overall negative user benefits (-£7,272,000 per annum), mainly derived from dis-benefits to highway and public transport users. Commuter trips by public transport decrease by -5.8%.	
Accessibility	Overall decrease in all trips to City Centre with the bridge closed, overall decrease of public transport trips of -3%. Significant decrease in users of park and ride at Pride Park. This is probably linked to the fact that with the bridge closed some traffic on London Road would decide to route through Pride Park creating additional delays.	✗✗✗
Safety	No significant change in accidents	Neutral
Environment	Very little change in environmental indicators	Neutral

The bridge remains an important link for London Road and radial access to the City Centre, particularly by public transport. This is reflected in the results where journey times are increased as a result of the closure of the bridge and as a result public transport trips decrease. As a result of the closure buses would have to be rerouted through Pride Park, extending the journey length and journey time for passengers.

The economic user benefits demonstrate the impact on both public transport and highway users. Without the bridge the City Centre would become less attractive for trips using the corridor.

3.10 Overall performance of Sector Tests

Overall the combined package of Smarter Choices, bus priority, traffic management and Park and Ride provided positive combined benefits. The combined package in the North East Sector (A52, Nottingham Road and A61 Corridors) provided the greatest overall benefits. The A52 and A61 are less constrained than the other corridors in terms of providing bus priority and traffic management solutions. In addition, the A52 and Nottingham Road corridor carry a significant number of bus services and passengers and both the A52 and A61 carry significant amounts of traffic. As such, any improvements on these corridors will bring about the most user benefits in terms of reduced delay and congestion.

The South West Sector produces the second highest levels of benefits from the combined package. Most of these benefits are derived from the Uttoxeter Road Corridor. The Park and Ride, which was tested on the Manor Kingsway site, had the most demand for users of the sites tested. The reason for this is probably its location and close proximity to the A38 and the fact that the Park and Ride is only 1.6 miles form the City Centre. As such, it is accessible from the Trunk Road network and travel to the City Centre is less than half the distance of the other Park and Ride sites.

The South East Sector (London Road and Osmaston Road Corridors) provide the least returns in terms of user benefits. However, these corridors are more constrained in terms of the types and levels of schemes that can be implemented. In considering priorities across the sectors of the City, we need to consider the current issues and problems and future demands such as growth. Whilst the A52 and A61 corridors show significant benefits the greatest pressure for future housing growth is likely to be on the southern edge of the City in South Derbyshire.

The other consideration needs to be the replacement or refurbishment of London Road Bridge. The scheme would seriously reduce access to southern area of the City Centre, potentially undermining the viability of regeneration schemes such as Castleward and the DRI site. In addition, there would be significant disbenefits to bus users who would experience significantly longer journeys via Pride Park into the City. This would undermine public transport on the corridor and any improvement schemes.

3.11 20 mph zones

In order to test 20 mph zones two different discreet residential areas of the City were chosen that could be easily cordoned off. The 20 mph zone areas were simulated by adjusting the speed limit on model links. The key points that were derived from the model results are summarised below.

Economy	Reduction in overall delays in highway network (between -1.2% and -3.1), and reduction in vehicle kilometres.	✗✗
	However, benefits from reduced delays are eroded by overall increase in journey times. Overall negative user benefits of -£4,113,000 per annum. From all the test results this option shows the most negative impacts.	
Accessibility	Slight decrease in total trips to the City Centre	✗
Safety	No significant changes	Neutral
Environment	Slight improvement in environmental indicators (-1.0% in CO)	✓

The test results show that the 20 mph zones reduce the level of delays across the different model time periods. This is the delay experienced at junctions as a result of either congestion or because it is controlled by signals. However, the overall journey times are increased as a result of the lower speed limit and this has a significant impact on highway user benefits. Journey times are either a result of lower average speed or increased journey length to avoid certain routes as a result of the 20 mph zones.

The 20 mph zones have negative user benefits for car and public transport users, particularly for trips into the City Centre. Conversely walking and cycling trips increase and there are no significant changes in accidents.

It seems that 20 mph zones do not have any impact on travel behaviour, except for walking and cycling where trips to the city centre across the day increase slightly. However, these trips have been abstracted from public transport rather than the car. It is surprising that there are not more benefits for accidents but then generally where 20 mph zones are introduced the average speed of traffic is already below 30 mph.

3.12 Network Wide Urban Traffic Control, such as Scoot and MOVA.

In total there are 55 signal controlled junctions in Derby of which 60% are either controlled by UTC, SCOOT or MOVA. The City Council has a rolling programme to upgrade key junctions and refurbish existing junctions. With future traffic growth, the control of the network will become increasingly important to maintain its reliability and safety. The use of systems such as MOVA provide the benefit of increasing junction capacity by dynamically controlling the real time flow of traffic on each arm and providing the optimum signal phasing.

As a broad policy test the 2026 reference case model was tested with and without the signal optimisation function switched on. This broadly simulates a network with and without UTC, SCOOT and MOVA to show the implications of not maintaining and investing in these systems. Only the highway model was used for this test and as such no results are provided from the demand model in terms of impacts on different modes of transport.

In summary the option test showed the following results.

Economy	Total delay across the day is decreased by -3.7%. The most significant decreases are reported in the PM Peak where delays decrease by -7.9%	✓✓✓
Accessibility		N/A
Safety	Slight decrease in accidents	-
Environment	Decrease in environmental indicators	✓

The results indicate that the optimisation of traffic signals provides significant benefits to the operation of the highway network. This not only provides benefits for car users but also public transport users. The efficiency of the network also slightly improves air quality as the overall delays and congestion decrease.

However, the test carried out was on a fixed matrix covering a single hour of each of the peaks. As such, the benefits are likely to be less pronounced in the AM Peak as in reality suppressed traffic from the hours either side of the peak would fill the gap created. As such, the benefits are more likely to be across the Inter Peak and PM Peak when the network is not as congested.

4 Conclusions of Option Test Results

4.1 Summary

Table 4.1 provides a summary of the results discussed in Section 3 for each of the individual tests that were undertaken.

It is important to note that our option tests looked at the effects of London Road Railway Bridge closing to traffic. This is because to determine what the benefits of replacing the bridge are we need to understand the problems that would be caused if the bridge was to be closed. The testing showed that if London Road Railway Bridge was to be closed, the top rated scheme would be to replace the bridge.

Table 3.1: DATM test summary appraisal results

Test	Economy	Accessibility	Safety	Environment
Reduction in Long Stay Spaces by 40%	-	N	N	+
Long Stay Parking Charge Increase (20% & 40%)	++	-	N	+
Integrated Bus Ticketing	+	-	N	+
Bus Service Enhancements	++	++	N	+
Measures to encourage Walking and Cycling	+	+++	N	-
Smarter choices sector test	-	++	N	N
Bus priority and traffic management sector tests	+	+	N	N
Park and Ride	++	+	N	N
London Road Bridge Closure	--	---	N	N
Urban Traffic Control	+++	N/A	N	+
20 mph Zones	--	-	N	+

Scoring:	+ Slight Beneficial	++ Moderate Beneficial	+++ Large Beneficial
N = Neutral	- Slight Adverse	-- Slight Adverse	--- Large Adverse

Overall the individual tests had only a marginal impact on safety and environmental indicators. However, individual tests are unlikely to have a significant impact unless they provide a large step change in peoples' travel habits. It is the larger schemes such as the replacement of London Road Bridge and the Park and Rides that show the most tangible changes but obviously cost the most money to deliver. In addition, there are many converse interactions that are occurring across the whole day that perhaps most transport models do not have the ability to model. For Derby it will be the combination of interventions that will provide overall benefits for the City.

The tests do show that some options do not provide any benefits against the test criteria. For example, the 20 mph zones have a significant impact on journey times for cars and public transport. In addition, there is a perception that interventions such as improving walking and cycling will pull commuters from their cars. DATM shows that whilst this does happen that abstraction can also be from public transport.

We know from the 6C's Congestion Management work that the in order to provide a step change in peoples travel habits that you need some form of demand management. However, this will not work unless you invest in public transport and sustainable travel choices, and promote travel choices through investment in smarter choices. Although, the

options for LTP3 are not considering something as drastic as congestion charging, the balance of managing travel demand, public transport, cycle and pedestrian improvements, and smarter choices still applies.

4.2 Towards a Preferred Strategy

The modelling shows that whilst some interventions tackle congestion in the AM Peak that travel demand in the Inter Peak needs to be managed to lock in benefits, in particular associated environmental benefits such as CO_2 that contribute to climate change. Reducing climate change is still an objective of the new HM Government.

The overall findings from the option testing process were as follows:

- Regulating the pricing (long and short stay), or some other form of traffic regulation has benefits, could be an effective measure for reducing congestion in the peak hours on the approach to the city centre;
- Integrated bus ticketing – particularly a smartcard based development of our current plans for a day ticket, helps to address problems in cross-city travel;
- Bus Service Improvements – particularly those which improve reliability and journey times, will help to drive and support increases in demand for travel via public transport;
- Walking & Cycling improvements will encourage increased use of these sustainable modes;
- Smarter Choices have a definite role to play as part of a wider strategy – however they are unlikely to have significant positive impacts if pursued as a stand alone strategy.
- Bus Priority & Traffic Management measures have an overall net positive effect as well as delivering benefits within the transport corridors.
- Park & Ride, in particular our long term aspiration for new sites close to the trunk road approaches to the city, is shown to be a very effective measure in delivering reductions in congestion across the city and within the main transport corridors.
- The replacement of London Road Bridge has to be the authority's top priority in terms of major schemes. Tests show that there will be major negative impacts from the gradual loss of service and closure of the bridge. This highlights the major benefits that can be obtained from replacing the bridge.
- Widespread use of 20mph zones are not recommended to be taken forward in the strategy. They are not shown to lead to any significant change in terms of safety and lead to major dis-benefits through increased journey times for all motorised users (including buses).
- The expansion and enhancement of Intelligent Transport Systems is shown as delivering significant benefits during the peak hours.

However, the testing also identified some aspects of the testing which identified potential issues with some of the measures that we had proposed. These issues are described below:

- The ability to regulate long and short stay parking pricing is undermined by the availability of cheap temporary parking and the amount of private non-residential parking in the city centre;
- Testing has shown that measures that address peak period congestion are likely to have a side-effect of inducing additional traffic during the inter-peak period and increased demand for city centre short stay parking outside of the peaks.

- This suggests that we need to make sure that we 'lock-in' the benefits of the strategy interventions. To do this we need to ensure that we tailor our strategy so that it delivers benefits across the whole day and not just the peak periods.

The result of the option testing process has helped us to identify those measures, which could be assessed in the transport model, that perform well and also those that don't. However, the modelling tests are not the only consideration as they could only test discrete measures that were possible to model.

Although not modelled, the maintenance of the asset is critical to the long term reliance and resilience of the transport network. Unless it can be maintained to a certain level benefits from improvements will be undermined by delays caused by increasing superficial maintenance works and wider impacts such as safety, security and ride quality. The stand alone tests on the closure of London Road Bridge and Urban Traffic Control demonstrated this to a certain degree.

4.3 Strategic Alternatives

Modelling of individual transport measures gives some idea how options might perform if introduced on a discrete basis. However, there are many considerations that need to be taken into account in the development of a transport strategy, such as the availability of funding and the relative level of priority given to expenditure in different areas. For example, the proportional split between the money that we spend on maintenance or cycling. Indeed, some areas such as road safety are central functions of the transport authority and a certain level of priority will always be given to it because of the tragic impacts and costs of personal injury accidents. As such, broad strategic alternatives were developed that considered broad strategy options.

Strategic alternatives are different ways of achieving the LTP3 goals and should be realistic. In order to define how individual measures could be prioritised, and appraise the effects on any particular strategy, they were grouped into similar themes based on the emerging Derby LTP3 goals and challenges. The Derby LTP3 transport themes are as follows:

Strategy Theme	Types of measures
Land Use Policies	focusing on putting developments in the right places, in particular the city centre, ensuring that more major trip attractors are located there and making sure that transport requirements are built into the design of new developments
Active Travel	walking, cycling, smarter choices and related safety and security
Public Transport	bus and community transport, rail, taxi, and related safety and security
Network Management	Intelligent Transport Systems, traffic management improvements including major road safety and environmental, freight, city centre access management and parking
Asset Management	maintenance of everything within the highway, including refurbishment of Intelligent Transport Systems and environment related maintenance

The strategic alternatives and transport themes were presented to the public and various stakeholder groups to understand the popular views on the long term transport strategy. The alternatives were also assessed as part of the SEA process to understand their relative environmental impacts. A description of the strategic alternatives can be found in the Strategic Alternatives Consultation document.

The next stage of the process was to model the preferred strategy, as far as possible, from the strategic alternatives based on the interventions listed. This required some sensitivity testing to understand the relationship between different interventions depending on the strategic direct direction of the long term strategy.

5 Testing the Preferred Long Term Transport Strategy

5.1 Introduction

In order to test the long-term transport strategy we combined together the successful measures from the broad option tests that broadly represent the preferred strategic alternative option. **Table 5.1** sets out a summary of the measures that performed successfully in the broad option tests grouped by the strategic themes.

Table 5.1. Summary of Beneficial Transport Option Tests

Theme	Transport Intervention
Land Use Policies	Policy measures to guide the location of development and sustainability of design together with policy measures to ensure that suitable conditions are placed on development to secure contributions towards necessary infrastructure and soft measures.
Public Transport	Bus service enhancements
Public Transport	Integrated bus ticketing
Public Transport	Park and ride
Public Transport	Bus priority and traffic management sector tests
Network Management	London Road rail bridge replacement
Network Management	Measures to influence car demand
Active Travel	Measures to encourage walking and cycling
Active Travel	Smarter choices
Asset Management	Maintenance of everything within the highway, including refurbishment of Intelligent Transport Systems and environment related maintenance.

All of the measures, apart from those listed under Land Use Policies and Asset Management can be tested within the DATM.

We tested two different scenarios for the long-term transport strategy representing different levels of investment. These are:

- The most likely scenario – this is based upon local transport investment being lower than during LTP2 reflecting the governments intention to curb public expenditure to address the deficit. This is a prudent scenario for the short and medium term, but may under estimate the investment that may be possible over the longer-term. Therefore, there is also a need for;
- The aspirational scenario – this is based upon assumptions that public expenditure will not be severely constrained throughout the whole strategy period of up to 2026 and that enhanced levels of investment may be available in the medium to longer term. This strategy also assumes that additional funding mechanisms may become

available together with larger private sector contributions to enable infrastructure enhancements to enable planned for growth in jobs and housing.

These two scenarios contain measures that were identified as being effective in the strategy development process. Our assumptions regarding the number and scale of schemes is informed from the evaluation of the strategic alternatives which identified that a broadly balanced approach across all five strategy themes (with an additional emphasis on active travel) would be the most appropriate combination for the long-term strategy.

5.2 Test Specification

Table 5.2 provides a summary of the measures that have been assumed in the test of the most likely scenario and **Table 5.3** provides a summary of measures that have been included in the aspirational scenario.

Table 5.2 – Most Likely Scenario for Long-Term Transport Strategy

Theme	Transport Intervention
Public Transport	Integrated Smart Card Bus Ticketing
Public Transport	Bus Service Enhancements (but no orbital bus route)
Public Transport	New Park and Ride site at Boulton Moor
Public Transport	Bus Priority Measures (although there will no new bus lanes)
Network Management	Replacement of London Road Bridge
Network Management	Measures to influence car demand
Network Management	Traffic management measures to address localised issues
Active Travel	Measures to encourage Walking and Cycling, including • Treating pedestrian and cycle safety hot spots together with other infrastructure improvements on major desire lines into City Centre; • Continued road safety training; and • Cycling and walking promotion.
Active Travel	• a smarter choices package including: • Travel awareness campaigns; • Continued road safety training; • Public transport information and marketing; • School travel planning; • Provide increased support for corporate travel plan; • Targeted workplace travel planning; • Work place travel planning through planning applications; and • Low level smarter choices

	campaigns.

Table 5.3 – Aspirational Scenario for Long-Term Transport Strategy

Theme	Transport Intervention
Public Transport	Integrated Smart Card Bus Ticketing
Public Transport	Bus Service Enhancements (but no orbital bus route)
Public Transport	New Park and Ride sites at: • Boulton Moor; • A61 to north of City Centre; • A52 to east of the city centre; and • An expanded facility at the city hospital site.
Public Transport	Bus Priority Measures (including new bus lanes where appropriate)
Network Management	Replacement of LondonRoadBridge
Network Management	Measures to influence car demand
Network Management	Traffic management measures to address localised issues
Active Travel	Measures to encourage Walking and Cycling, including • New cycle lanes and advanced stop line facilities; • Investigation and resolution of accident problems; • Provision of new and enhancement of existing cycle tracks and cycle track crossings • Continued road safety training; and • Cycling and walking promotion.
Active Travel	A smarter choices package including: • Development of a strong brand identity; • Travel awareness campaigns; • Cycling and walking promotion; • Public transport information and marketing; • School travel planning; • Workplace travel planning. • Continued road safety training; and • Provide increased support for corporate travel plan.

Most of the measures summarised in Tables 5.2 and 5.3 were modelled as defined in the individual tests outlined in Chapter 3 of this report, except on a city wide basis rather than by corridors. However, investment in measures such as walking, cycling, smarter choices and integrated bus ticketing are more nebulous to model without a detailed implementation strategy. For example, modelling investment in walking and cycling is difficult unless you have a defined inventory of the exact physical schemes that are to be implemented. In addition, DATM cannot independently model the attractiveness of travel choices through the promotion of smarter choices or the introduction of an integrated bus ticket. As such, assumptions have to be made of the potential changes in the attractiveness of modes as a result of such measures. This is done through changing the generalised cost travel of modes of transport within the model (see Section 3.6). In modelling the two scenarios some assumptions had to be made of the potential benefits of these measures combined. The basis of the generalised cost change assumptions were taken from the East Midlands TIF and Greater Manachester TIF studies.

The following reductions in generalised cost have been applied in order to represent the measures defined in the Most Likely and Do More Scenarios:

Most Likely	Do More
• a 2.5% reduction in the generalised cost of Public Transport journeys within Derby, subject to a maximum journey time reduction of 2.5 minutes; and • a 2.5% reduction in the generalised cost of walk/cycle journeys within Derby, subject to a maximum journey time reduction of 2.5 minutes.	• a 5% reduction in the generalised cost of Public Transport journeys within Derby, subject to a maximum journey time reduction of 2.5 minutes; and • a 5% reduction in the generalised cost of walk/cycle journeys within Derby, subject to a maximum journey time reduction of 2.5 minutes.

**Note: The changes to generalised costs were made to city bound trips only based on the assumption that this is where the most benefits are likely to be gained.

5.3 Summary of Results

Table 5.4 summarises the test results against the appraisal criteria outlined in Section 2 for the two long term transport strategy scenarios effects in 2026, when compared against the 2026 situation without the long term transport strategy.

Table 5.4 – Aspirational Scenario for Long-Term Transport Strategy

Strategic Measures	Most Likely Scenario	Aspirational Scenario
Accidents		
Change in total accident numbers	+0.2%	+0.6%
Change in numbers killed or seriously injured	+0.2%	+0.6%
Air Quality		
Change in Carbon Monoxide (CO) emissions	-2.8%	+3.4%
Change in Particulate (PM_{10}) emissions	-1.8%	+0.9%
Change in Nitrogen Dioxide (NO_2) emissions	-1.3%	+0.7%
Change in Carbon Dioxide (CO_2)	-1.8%	+1.9%

Emissions		
Car Traffic		
Overall change in car kilometres	-1.0%	-1.4%
Overall change in car hours	-0.4%	-1.0%
Overall change in Car speed	-0.6%	-0.3%
Delays in the morning peak		
Total delay	-2.8%	+0.3%
Total vehicle kilometres	+0.1%	0.0%
Total delay per vehicle kilometre	-2.9%	+0.3%
Change in commuter trips to the city centre		
Change in car trips	-0.8%	-1.5%
Change in public transport trips	+12.3%	+29.9%
Change in walking and cycling trips	+0.5%	+2.3%
Total change in trips	+0.5%	+1.7%

As a guide to the significance of the results it should be noted that percentage changes below 5% are considered to be relatively marginal, between 5% and 10% are considered material and above 10% significant. The testing of the combined strategy shows that the type of measures that we are planning to take forward as part of the long-term strategy will have a relatively positive overall effect. The most likely scenario has positive effects on air quality, levels of car traffic, delays and commuter trips. The aspirational scenario has better results in terms of reducing car traffic and encouraging the use of public transport walking and cycling.

The actual impacts of the strategy will vary depending upon the actual funding that is made available to invest in local transport. Our aim is to deliver changes from the implementation of the strategy which are within the range between the most likely and aspirational scenarios.

6 Summary and Conclusion

This working paper provides a summary of the modelling undertaken using the Derby Area Transport Model (DATM) to inform the development of a preferred long term transport strategy for the Derby LTP area over the 15 year period to 2026. The preferred long term transport strategy will set out future priorities for investment in transport and a short term plan of specific interventions covering the two year financial period between 2011/12 and 2012/13.

DATM provides a tool to help analyse the current transport problems within Derby and predict the likely transport problems that we will face in the future, as a result of economic and land use growth and changing travel patterns. It can predict the possible impacts of transport options and strategies providing a range of statistics and outputs that can be fed into economic, accident and environmental appraisal models.

In total, eleven broad option tests were undertaken using DATM and the forecast 2026 scenario. These options were drawn from the option development process as set out in the Option Development Working Paper, which sets out the background and long term transport strategy option generation methodology

Not every strategy option can be directly modelled using the Derby Area Transport Model. This is because not all options can be represented within a strategic transport model or would provide tangible results. For example, network management options such as Freight Quality Partnerships or Street Work Permit Scheme. There are benefits of including these options in the Longer Term Transport Strategy but the justification is based on current evidence and wider benefits that cannot be quantified by the model.

The overall findings from the option testing process were as follows:

- Regulating the pricing (long and short stay), or some other form of traffic regulation has benefits, could be an effective measure for reducing congestion in the peak hours on the approach to the city centre;
- Integrated bus ticketing – particularly a smartcard based development of our current plans for a day ticket, helps to address problems in cross-city travel;
- Bus Service Improvements – particularly those which improve reliability and journey times, will help to drive and support increases in demand for travel via public transport;
- Walking & Cycling improvements will encourage increased use of these sustainable modes;
- Smarter Choices have a definite role to play as part of a wider strategy – however they are unlikely to have significant positive impacts if pursued as a stand alone strategy.
- Bus Priority & Traffic Management measures have an overall net positive effect as well as delivering benefits within the transport corridors.
- Park & Ride, in particular our long term aspiration for new sites close to the trunk road approaches to the city, is shown to be a very effective measure in delivering reductions in congestion across the city and within the main transport corridors.
- The replacement of London Road Bridge has to be the authority's top priority in terms of major schemes. Tests show that there will be major negative impacts from the gradual loss of service and closure of the bridge. This highlights the major benefits that can be obtained from replacing the bridge.

- Widespread use of 20mph zones are not recommended to be taken forward in the strategy. They are not shown to lead to any significant change in terms of safety and lead to major dis-benefits through increased journey times for all motorised users (including buses).
- The expansion and enhancement of Intelligent Transport Systems is shown as delivering significant benefits during the peak hours.

However, the testing also identified some aspects of the testing which identified potential issues with some of the measures that we had proposed. These issues are described below:

- The ability to regulate long and short stay parking pricing is undermined by the availability of cheap temporary parking and the amount of private non-residential parking in the city centre;
- Testing has shown that measures that address peak period congestion are likely to have a side-effect of inducing additional traffic during the inter-peak period and increased demand for city centre short stay parking outside of the peaks.
- This suggests that we need to make sure that we 'lock-in' the benefits of the strategy interventions. To do this we need to ensure that we tailor our strategy so that it delivers benefits across the whole day and not just the peak periods.

The result of the option testing process has helped us to identify those measures, which could be assessed in the transport model, that perform well and also those that don't. However, the modelling tests are not the only consideration as they could only test discrete measures that were possible to model.

Although not modelled, the maintenance of the asset is critical to the long term reliance and resilience of the transport network. Unless it can be maintain to a certain level benefits from improvements will be undermined by delays caused by increasing superficial maintenance works and wider impacts such as safety, security and ride quality. The stand alone tests on the closure of London Road Bridge and Urban Traffic Control demonstrated this to a certain degree.

Modelling of individual transport measures gives some idea how options might perform if introduced on a discrete basis. However, there are many considerations that need to be taken into account in the development of a transport strategy, such as the availability of funding and the relative level of priority given to expenditure in different areas. As such, broad strategic alternatives were developed that considered broad strategy options. Strategic alternatives are different ways of achieving the LTP3 goals and should be realistic.

The strategic alternatives and transport themes were presented to the public and various stakeholder groups to understand the popular views on the long term transport strategy. The alternatives were also assessed as part of the SEA process to understand their relative environmental impacts.

The next stage of the process was to model the preferred strategy, as far as possible, from the strategic alternatives based on the interventions listed. This required some sensitivity testing to understand the relationship between different interventions depending on the strategic direct direction of the long term strategy.

In order to define how individual measures could be prioritised, and appraise the effects on any particular strategy, we tested two different scenarios for the long-term transport strategy representing different levels of investment. These are:

- The most likely scenario – this is based upon local transport investment being lower than during LTP2 reflecting the governments intention to curb public expenditure to address the deficit. This is a prudent scenario for the short and medium term, but

may under estimate the investment that may be possible over the longer-term. Therefore, there is also a need for;

- The aspirational scenario – this is based upon assumptions that public expenditure will not be severely constrained throughout the whole strategy period of up to 2026 and that enhanced levels of investment may be available in the medium to longer term. This strategy also assumes that additional funding mechanisms may become available together with larger private sector contributions to enable infrastructure enhancements to enable planned for growth in jobs and housing.

The testing of the combined strategy shows that the type of measures that we are planning to take forward as part of the long-term strategy will have a positive overall effect. The most likely scenario has positive effects on air quality, levels of car traffic, delays and commuter trips. The aspirational scenario has better results in terms of reducing car traffic and encouraging the use of public transport walking and cycling.

The actual impacts of the strategy will vary depending upon the actual funding that is made available to invest in local transport. Our aim is to deliver changes from the implementation of the strategy which are within the range between the most likely and aspirational scenarios.