

CAMBRIDGE EAST SUSTAINABLE TRANSPORT STRATEGY

Technical Note B: Strategic Choice Report

Appendix B

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Prepared for:

Cambridge East Transport Topic Group
c/o Cambridgeshire County Council
Castle Court
Cambridge
CB3 0AP

Prepared by:

Steer Davies Gleave
West Riding House
67 Albion Street
Leeds
LS1 5AA

+44 (0)113 242 9955
www.steerdaviesgleave.com

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ANNEX

A EXPLANATION FOR DISCARDED OPTIONS

SUMMARY

Introduction

1. This report summarises the outputs of our Strategic Choice workstream which comprised a workshop with stakeholders followed by further detailed in-house discussion and assessment. Below, the full interim report, as issued in March 2006, is reproduced.
2. The work has been used to produce short-lists of highway and public transport options for serving Cambridge East. Cycling/walking options have not been incorporated into this assessment in any detail¹. This in no way signals a lack of priority to cycling/walking. Indeed, if Cambridge East is to achieve its target of less than 60% car modal share, cycling and walking will have to provide the majority of these non-car trips. However, decisions on walking/cycling schemes can mostly be taken independently from considerations on highways/public transport. Any preferred solution is likely to include a “maximum cycling/walking package” as part of it.
3. This summary explains our overall conclusions to the exercise, whilst the main report details the workings.
4. The strategic choice work is an interim part of our study and the findings of the work are based primarily on logic and qualitative grounds. Quantitative work, namely examining travel demand towards key destinations, carrying out more detailed engineering assessments and testing outcomes via the Long Term Transport Strategy traffic model are occurring in parallel to improve the robustness of the study findings.

Next steps

5. We will discuss the outcomes of this work with the steering group to ensure consensus over the interim conclusions we have reached. Then we will conduct more detailed work examining specific short-listed schemes, in order to identify the specific solutions that work best.
6. The strategic choice work has looked at Cambridge East in its end-state, in order to develop an overall transport strategy for serving it. A crucial part of the next phase will be to consider how these preferred options can be delivered in relation to the phasing of Cambridge East to assess when different schemes are required in terms of demand and feasibility. Through our own assessments and use of the Long Term Transport Strategy modelling, we will be looking to assess the demand case for public transport options and the impact of packages of schemes on the network.

¹ This is for two reasons: first, decisions on cycling/walking links stand largely independently from decisions on highway and public transport links; second, in most cases, there will be a desire to improve *all* cycling links to particular destinations, in order to maximise penetration and accessibility, whereas for public transport and highway schemes, the decision is to select one of many possible schemes.

Interim Conclusions

7. Below we summarise the conclusions drawn from the strategic choice work.

Destinations

8. It has been agreed that there are 3 primary key destinations:
- Cambridge City Centre;
 - Northern Fringe (Chesterton sidings, Science Park and potentially beyond to Cambridge North West);
 - Southern Fringe (Addenbrooke's and beyond to new southern fringe development by Trumpington).
9. The following secondary destinations are also important:
- Cambridge Rail Station: as a destination in its own right (in relation to high levels of employment close by) and as access to the rail network, though if Chesterton Sidings were developed into a rail station, this could provide an alternative;
 - Recreational links, particularly to countryside to the east and north by walking and cycling.
10. We have identified short-listed combined highway and public transport options to these 3 primary destinations. In each case, a long-list of public transport options and highway options have been appraised separately against a range of evaluation criteria agreed at the Strategic Choice workshop. These criteria fall into four broad categories, namely policy objectives, transport outcomes, environmental impacts and financial implications (see main report for explanation of criteria). A 'compatibility matrix' of short-listed highway and public transport options has then been assembled to identify packages of measures that potentially could be done in combination. These packages have subsequently been appraised to derive our short-listed preferred packages to the 3 primary destinations, as follows (full workings are shown in main report):

Cambridge City Centre:

11. Two public transport options have been short-listed out of seven potential options originally identified:
- Segregated busway running along the edge of Coldhams Common to avoid existing highway and to offer good penetration into Cambridge East (especially phases 2 and 3);
 - Major bus priorities along the western section of Newmarket Road, with buses serving phases 2 and 3 via Barnwell Road.
12. Highway capacity: the Coldhams Common option would potentially allow additional highway capacity (for cars) to be provided on Newmarket Road. We do not see this as a primary objective of either the Long Term Transport Strategy or the Cambridge East Transport Strategy. Nonetheless, it is potentially a useful option if the levels of general traffic growth with major development in this sector of Cambridge risk congestion. Subsequent detailed traffic modelling work should be able to provide an assessment of

likely growth in demand for car travel, and hence whether additional highway capacity is necessary/desirable.

Cambridge Northern Fringe:

13. Three combined highway/public transport schemes have been short-listed out of 6 potential highway options and 4 potential public transport options:
 - Fen Ditton link road plus guided busway to Chesterton;
 - Fen Ditton link road plus bus service via Milton Road;
 - Quy interchange upgrade and guided busway parallel to the railway line; and
 - Quy interchange upgrade, plus bus service via Milton Road.
14. Options including a new junction with the A14 at Honeyhill were considered and dismissed. Whilst Honeyhill had additional financial and environmental costs compared to the above options, it had few or no additional benefits above and beyond what these options can provide.

Cambridge Southern Fringe:

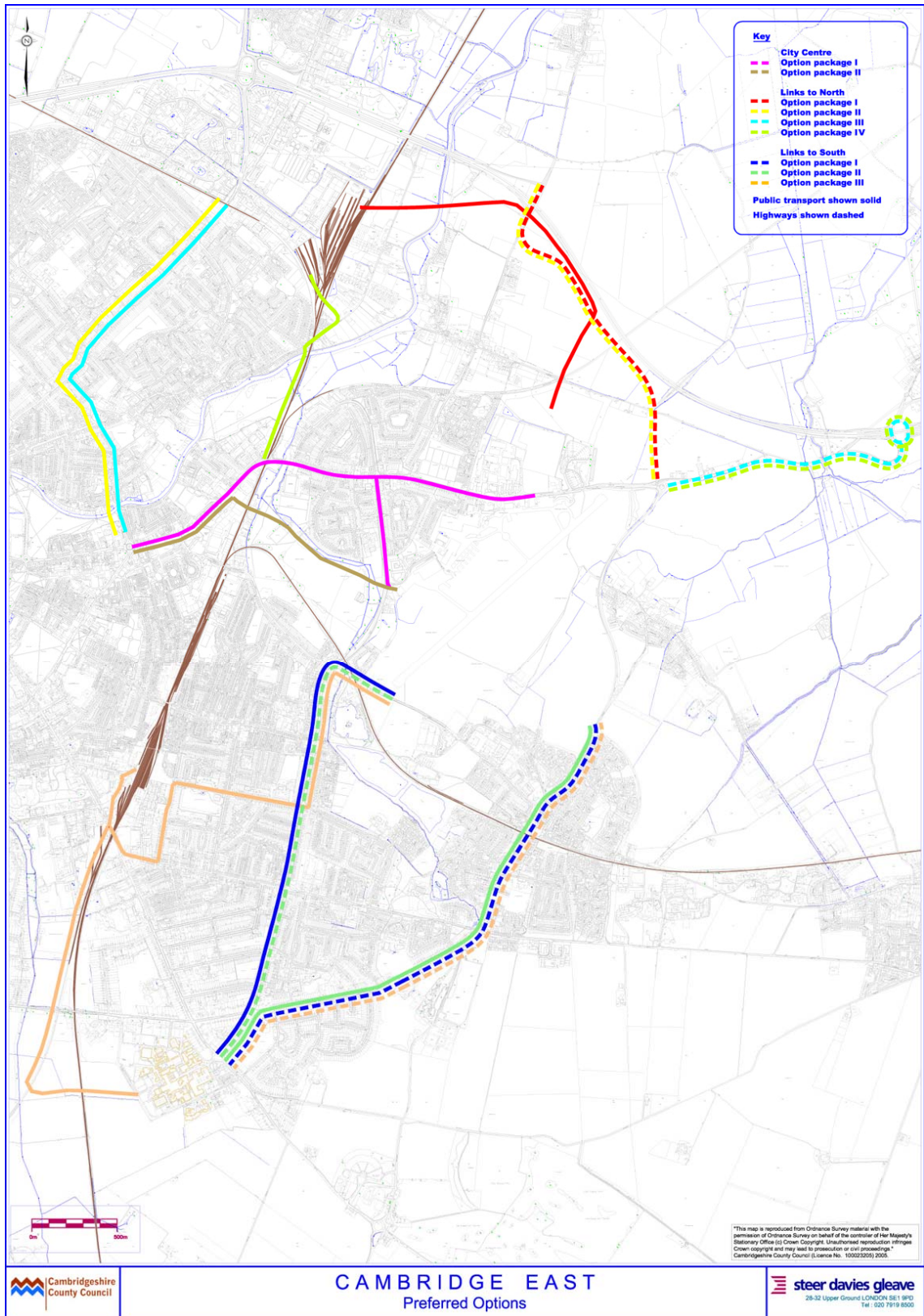
15. Three combined highway/public transport schemes have been short-listed out of 4 potential public transport options and 3 potential highway options originally identified.
 - Improving Perne Road for car access towards the Southern Fringe and the Cherry Hinton corridor for buses;
 - Improving the Cherry Hinton corridor for car access towards the Southern Fringe and the Perne Road corridor for buses;
 - Improving the Cherry Hinton corridor for car access and providing bus services to the Southern Fringe via Perne Road, rail station and guided busway.
16. Options that included the proposed Southern Relief Road did not make it to the shortlist, primarily in terms of environmental and financial cost. The Southern Relief Road does little to provide enhanced bus links that other schemes don't potentially achieve and the provision of additional highway capacity *to access the southern fringe* does not help our attempt to maximise non-car use.
17. However, the Long Term Transport Strategy, taking into account growth in traffic across Cambridge over the next 15 years and strategic traffic (rather than solely access to the southern fringe) may deem that a southern relief road is necessary for more strategic purposes. If this were implemented, it could benefit public transport solutions using either Cherry Hinton or Perne Road as it enables these routes to have greater levels of bus priority and decongestion than otherwise.

Towards a preferred scheme:

18. The strategic choice method does allow these shortlisted options to be combined to produce an overall preferred package. However, given the predominantly qualitative nature of the evaluation carried out so far and the fact that these shortlisted options all score reasonably closely, we consider it is best to keep all of these options until more detailed technical work has been completed.

- Our public transport/highway options to each distinct destination seem to be reasonably independent of each other. One of the most notable potential synergies is that a bus solution to the Southern Fringe that goes via the rail station and then the guideway to Trumpington could assist in strengthening services along the southern access to the city centre as well as serving the secondary destination of Cambridge rail station itself.
19. Our evaluations show, perhaps unsurprisingly that ‘bolder’ highway and public transport options score very positively against transport and policy objectives, but very negatively against environmental and financial objectives.
 20. Some of the more ambitious public transport solutions may not be justified by Cambridge East in isolation. However, within a supportive policy context of seeking to establish a Cambridge-wide high quality, segregated bus network, there may be justification for using Cambridge East and other new developments to help realise this. For example, a link from Cambridge East to Chesterton is financially and environmentally costly and the levels of demand for this single trip destination will not be great. However, a Cambridge East to Chesterton to Science Park to Cambridge North West orbital route could become a very useful strategic corridor, with many in-scope trips. At the moment, all Cambridge bus services go via the city centre which has severe capacity constraints, so creating alternative orbital routes could also have wider network benefits. Similarly, within this policy framework, a route from Cambridge East to the Southern Fringe via the rail station and then onwards via the guided busway could be attractive.
 21. Figure 1 shows the short-listed packages for these three primary destinations.

FIGURE 1 PREFERRED OPTIONS



1. INTRODUCTION

1.1 This report summarises events at the Strategic Choice workshop held at Shire Hall on Friday 20 January 2006. The report is designed to do two things:

- To report back on the workshop, summarising the work done and the issues raised; and
- To extend that work, describing tasks to be undertaken next.

1.2 The workshop was held from 11am to 3pm, with invited attendees as listed in Table 1.1 below. Staff from Steer Davies Gleave facilitated the session.

TABLE 1.1 ATTENDEES

Name	Organisation	Role
Steve Sillery	Bidwells	Planning consultant to Marshall
Barry Louth	Cambridge City Council	Transport policy officer
David Bradford	Cambridge City Council	Cycling officer
Huw Nicholas	Cambridgeshire County Council	Transport Manager Assessment
Kathy Baldwin	Cambridgeshire County Council	Sustainable Manager Communities
Janet Martin	Cambridgeshire County Council	Environment quality officer
Tim Carter	Cambridgeshire County Council	Environment (TravelWise) officer
John Onslow	Cambridgeshire Horizons	Director, development and projects
Colin Bambury	Highways Agency	Planning Manager, Network Strategy East
Joanathan Barker	Marshall	Company secretary
Caroline Hunt	South Cambridgeshire District Council	Principal Planning Officer
Jonathan Dixon	South Cambridgeshire District Council	Principal Planning Officer
Andy Campbell	Stagecoach in Cambridge	Managing Director
John Hicks	WSP	Transport consultant to Marshall
Martin Higgitt	Steer Davies Gleave	Cambridge East project manager
Michael May	Steer Davies Gleave	Cambridge East project director
John Swanson	Steer Davies Gleave	Strategic Choice convenor

Strategic Choice

- 1.3 The format used for the workshop is known as ‘Strategic Choice’. This was originally developed by John Friend and Allen Hickling, and described in the book “Planning under Pressure”. It is designed to provide a structured approach to planning problems where there may be many possible courses of action to choose from, a range of points of view to be taken into account, and a number of uncertainties, any of which could impact on the final decision.
- 1.4 In summary, the approach focuses attention on a sequence of topics:
- Decision areas (DAs) – things about which decisions must be made;
 - Comparison areas (CAs) – the criteria to be used to compare and assess options (i.e. evaluation criteria);
 - Decision options – specific options that are available in each decision area.
- 1.5 The process includes stages in which linkages between DAs are examined, decision options tested for consistency, and coherent packages of options generated for further analysis and testing.
- 1.6 Preparatory work before the workshop had generated lists of DAs and decision options, and an initial set of CAs. These were presented to the workshop as a starting point.

2. THE WORKSHOP

Introduction

- 2.1 Preliminary work had identified that there were three important dimensions to the problem that might be addressed at the workshop:
- The primary transport movement corridors linking the development to centres of employment, leisure activities, education and shopping;
 - The phasing of the development over time, with three distinct phases of construction; and
 - The physical design of the development, such as the housing density, location of phases, provision of car parking etc.
- 2.2 To keep the scope of the workshop focused on the most pertinent issues – important, given the time commitment of the attendees and the fact that only one workshop was scheduled – the following decisions were made:
- We would not address design issues relating to the development itself, and these would be taken as given in the brief;
 - Given the need to address quite complex transport issues, it was felt that it would be too much to deal with these and to consider the phasing of the development over time. Of course this must be addressed in the study, but during the workshop participants were asked to consider what Cambridge East would be like after the whole development was built, with 11,500 houses.
 - The workshop would focus on the transport provision to and from the development area. This was, of course, the main focus of the original brief. Three primary corridors were identified: to the northern fringe and A14; to the city centre; and to Addenbrooke’s and the south.
- 2.3 Preliminary work had identified numerous transport options, and these were presented in such a way as to start the workshop ‘at a run’. A short presentation was given to attendees describing the development and the expected scale of its impact on transport in Cambridge. Following this, the Strategic Choice workshop began.

Decision Areas

- 2.4 Decision Areas (DAs) are simply things about which decisions, or choices, must be made. They are decisions about actions that might be taken, things that might be done, in order to implement the finally chosen strategy, rather than choices about end states, such as mode shares.
- 2.5 At first they are considered without much reference to what the possible options might be. The value of doing this is to focus attention of the areas where any proposed strategy must take action, without getting trapped into too much detail.
- 2.6 A preliminary list was developed by Steer Davies Gleave in advance, and offered to the group for consideration. Table 2.1 lists the DAs offered. In each case they are given a short label to make it easier to refer to them on subsequent wall charts.
- 2.7 By and large the DAs are focussed on the three primary movement corridors, and

simply identify that public transport, highway and walk/cycle options might be considered in all cases. We also identified access to the station as a distinct issue, for two reasons: its intrinsic significance as an important edge of centre destination / transport hub and as a point of access to the rail network; and because of the possibility of a new station to the north at Chesterton Sidings which could replicate one of these functions.

TABLE 2.1 DECISION AREAS

Label	Decisions about...
PT-N?	Public Transport links to Northern Fringe
PT-CC?	Public Transport links to City Centre
PT-S?	Public Transport links to Addenbrooke's and the south
PT-Railway?	Public Transport links to station and rail network
HW-N?	Highway links to Northern fringe
HW-CC?	Highway links to City Centre
HW-S?	Highway links to Addenbrooke's and the south
WC-N?	Walk/Cycle links to Northern fringe
WC-CC?	Walk/Cycle links to City Centre
WC-S?	Walk/Cycle links to South
WC_Railway?	Walk/Cycle links to station and rail network

2.8 These DAs were accepted by the attendees, but two other possibilities were suggested:

- It was noted that the capacity to handle buses in the city centre is already stretched, and additional bus services would add to the congestion, causing delays and operational difficulties. It was therefore noted that capacity to handle buses on the city centre was an important issue, perhaps meriting another DA, labelled PT_CCC?;
- It was also requested that access to the east (for recreational purposes) should be considered. This was agreed, but taken to be outside the main scope of work for the day.

Comparison Areas

2.9 A list of candidate Comparison Areas (CAs) was prepared in advance and offered to the attendees. In the course of the discussion some amendments to the list were requested:

- Air quality, Environ_AQ, was added to the list of environmentally related CAs;
- Mode shares for PT and walk/cycle were to be identified separately, rather than giving primacy to the car mode;
- The financial viability of proposed PT services was added, PT_Revenue;
- The overall cost was added.

2.10 Table 2.2 gives the final list of CAs. As with the DAs, each is given a label to make them easier to refer to in subsequent work.

TABLE 2.2 COMPARISON AREAS

Label	Definition
Political	Political Acceptability
Compliance	Compliance with Area Action Plan
Environ-W	Impact on environment - Wildlife
Environ-Am	Impact on environment - Amenity
Environ-AQ	Impact on environment - Climate Change & Air Quality
Environ-FP	Impact on environment – Flood Plain
Cong-SR	Congestion on strategic roads
Cong-LR	Congestion on local roads
Car-MS	Car mode share to/from CE
PT-MS	PT mode share to/from CE
PT-CCC	PT Congestion in City Centre
Property	Acquisition / CPO / demolition
PT-Revenue	PT financial viability
Cost	Financial viability / Cost
WC-MS	Walk & Cycle mode share
Guided Bus	Complement Guided Bus proposals

Links between DAs

2.11 A short exercise was undertaken to look for links between DAs, in the sense that two DAs are linked if choices in one of them cannot realistically be made without considering choices in the other: in other words, that they are not independent of each other.

2.12

Figure 2.1 is a photograph of the linkage chart generated. The nature of the DAs meant that the main linkages were corridor-based, so we see at the top that PT, highway and walk/cycle links to the northern fringe were all linked, while similar grouping exist for the three modes into the city centre and to the south.

- 2.13 We see also that public transport access to the city centre, PT_CC?, is one of the most densely linked DAs, since it is linked to five other DAs.
- 2.14 The dense clustering of links around city centre movements suggested that this would a productive place to begin further work. In the next step we therefore looked at options for all the DAs relating to access to the city centre (PT_CC?, HW_CC?, and WC_CC?) and public transport access to the railway, PT_Railway?.

FIGURE 2.2 PUBLIC TRANSPORT OPTIONS TO THE CITY CENTRE, NORTHERN FRINGE AND SOUTHERN FRINGE

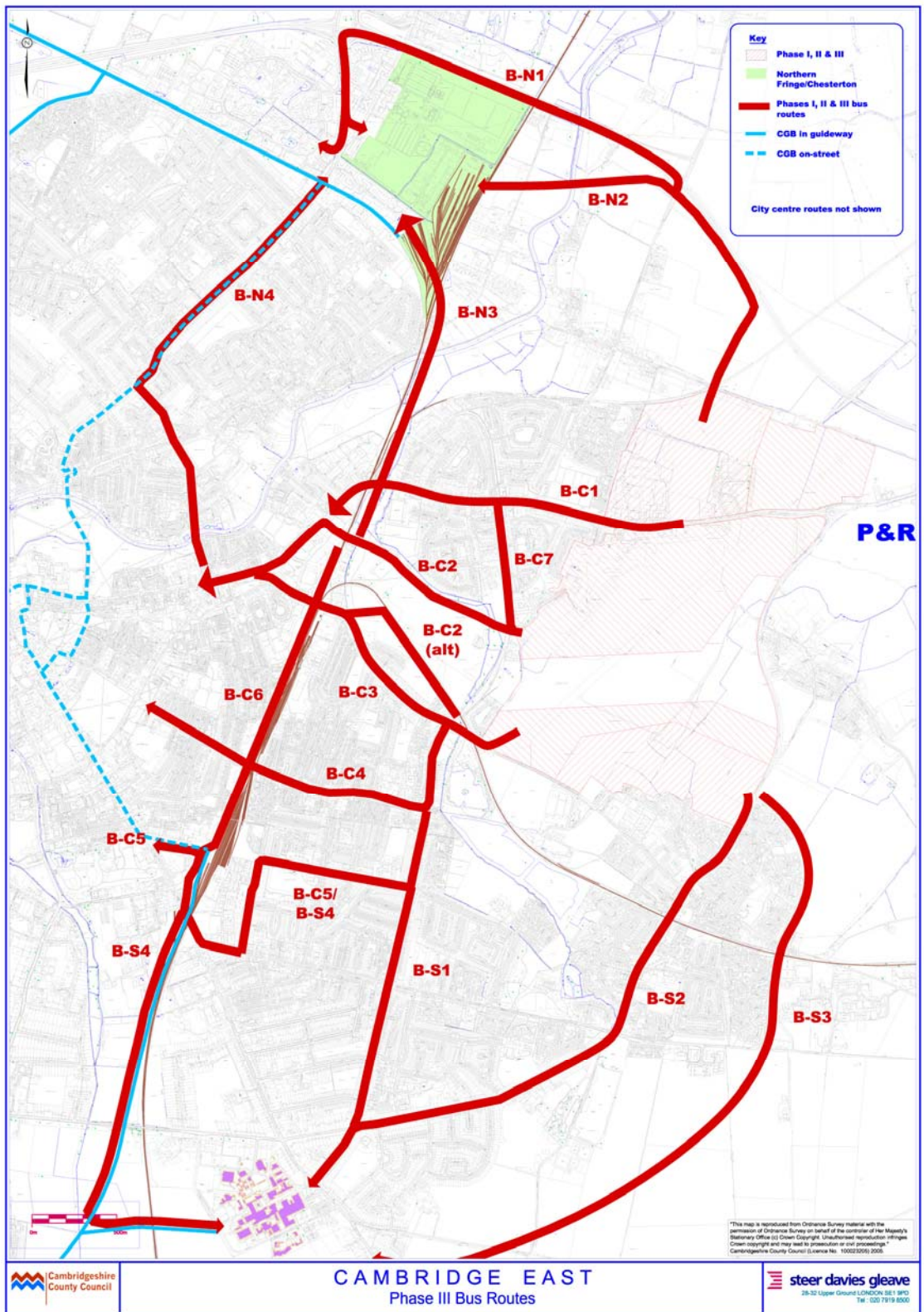


FIGURE 2.3 HIGHWAY OPTIONS TO THE CITY CENTRE, NORTHERN FRINGE AND SOUTHERN FRINGE

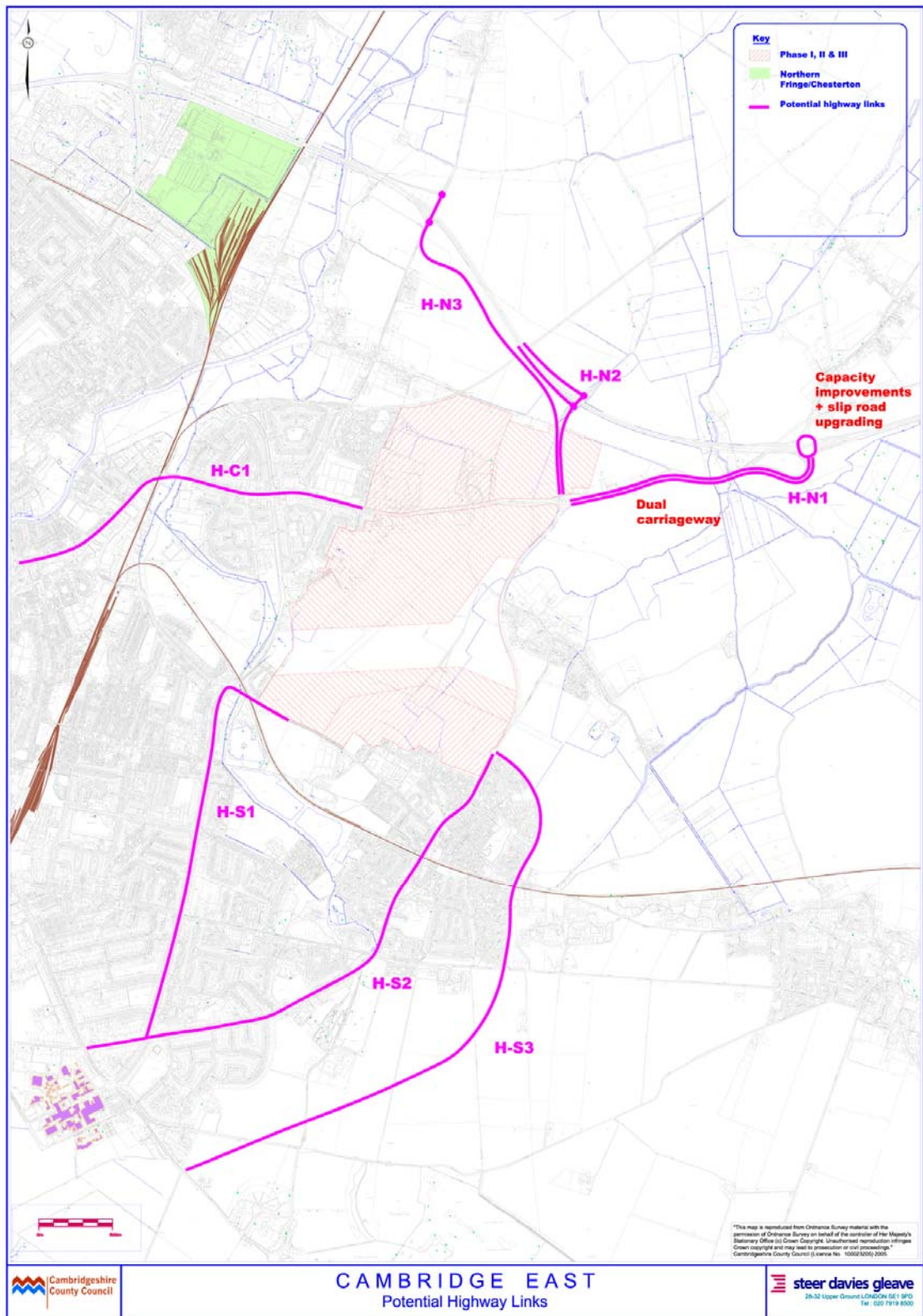


TABLE 2.3 OPTIONS FOR PUBLIC TRANSPORT ACCESS TO THE CITY CENTRE (PT-CC?)

DA	Option	Label
PT-CC?	Bus segregation on Newmarket Road	B-C1
	Bus segregated way on Coldham's Common	B-C2
	Coldham's Lane	B-C3
	Bus priority Mill Road	B-C4
	Cherry Hinton / Hills Road	B-C5
	Busway parallel to Railway	B-C6
	Busway Coldham's Common parallel to Railway	B-C2*

2.19 The remaining five options were grouped into four sets of combined packages, that is bundles of options that might in practice be considered as alternatives to each other. These options were designed to be mutually exclusive: in this way they were intended to represent a set of clear strategic options for PT access to the city centre. The bundles are set out in Table 2.4.

TABLE 2.4 STRATEGIC COMBINATIONS OF OPTIONS FOR PT ACCESS TO CITY CENTRE

Strategic Option Label	Component labels	Description
PT_CC_1	B-C1 + B-C2/B-C2*	Combination of bus segregation on Newmarket Road and a segregated busway on Coldham's Common.
PT_CC_2	B-C1 + B-C3	Combination of bus segregation on Newmarket Road and a new service along Coldham's Lane
PT_CC_3	B-C2/B-C2*	Segregated busway on Coldham's Common
PT_CC_4	B-C1	Bus segregation on Newmarket Road.

2.20 For HW_CC? there are two potential options, to do nothing or to increase general highway capacity along Newmarket Road towards the centre. The increased highway capacity option (whether desirable or not) can only work in combination with a bus option that does not rely on Newmarket Road. The only option that does this is Coldhams Common (B-C2).

2.21 Table 2.5 sets out the options for walk and cycle to the city centre, WC_CC?.

2.22 It was felt that the only strategic option here was to bundle all four of these options together. This is because of the extensive nature of Cambridge East and the need to offer good levels of penetration and sufficient capacity for cycling to the city centre for all parts of the development. In other words the only strategic option for walk and cycle to the city centre was Jubilee Way plus Newmarket Road/ColdhamsCommon plus Coldham's Common.

TABLE 2.5 OPTIONS FOR WALKING AND CYCLING TO THE CITY CENTRE (WC_CC?)

DA	Option	Label
WC-CC?	Jubilee Way	Cy-C1
	Newmarket Road / Coldham's Common	Cy-C2
	Coldham's Common	Cy-C3
	Natal Road / Railway Station	Cy-C4

2.23 Time precluded a detailed assessment of PT_Railway? The strategic options identified for access to the city centre were, therefore the four PT bundles identified in Table 2.4 and the walk/cycle bundle of priority routes.

2.24 It was judged that there were no conflicts between the PT strategic options and the walk/cycle options, except perhaps that on-road bus improvements on Newmarket Road or other corridors could conflict with cycling on those routes, but this is a matter of detailed design. In other words, the walk/cycle bundle could feasibly be implemented with any of the PT bundles.

2.25 During the discussions about these options it became clear that links with the northern fringe and/or the A14 needed to be addressed, for they were closely linked with options for the city centre. The next stage was to examine access to the north.

Options for public transport and highways to the North and the Northern Fringe (PT_N? and HW_N?)

2.26 Table 2.6 sets out the identified PT options for access to the Northern Fringe.

TABLE 2.6 OPTIONS FOR PUBLIC TRANSPORT ACCESS TO THE NORTHERN FRINGE (PT_N?)

DA	Option	Label
PT-N?	Via new Fen Ditton link road & A14	B-N1
	Via new Fen Ditton link road and busway to Chesterton	B-N2
	Via Busway parallel to Rail corridor	B-N3
	Via existing highway: Newmarket Rd / Milton Road	B-N4

2.27 As with PT access to the city centre, it was considered whether any of these options should be grouped into strategic ‘bundles’. In practice it was felt that each option was a valid distinct strategic option on its own and there would be little benefit of addressing demand to the Northern Fringe through more than one of these options. Therefore, the options taken forward directly replicate those above and are shown in Table 2.7.

TABLE 2.7 STRATEGIC COMBINATIONS OF OPTIONS FOR PT ACCESS TO THE NORTHERN FRINGE

Strategic Option Label	Component labels	Description
PT_N_1	B-N1	Link road & A14
PT_N_2	B-N2	Link Road and Busway to Chesterton
PT_N_3	B-N3	Busway parallel to Rail corridor
PT_N_4	B-N4	Milton Road

2.28 Table 2.8 sets out the identified options for Highway links to the north.

TABLE 2.8 OPTIONS FOR HIGHWAYS ACCESS TO THE NORTH AND NORTHERN FRINGE (HW_N?)

DA	Option	Label
HW_N?	Quy interchange	H-N1
	New junction	H-N2
	Fen Ditton and new link	H-N3
	Close Fen Ditton slip roads	H-N4

2.29 Once again, these options were grouped into bundles, representing strategic options that might be chosen from. Table 2.9 sets out the four strategic options that resulted.

TABLE 2.9 STRATEGIC COMBINATIONS OF OPTIONS FOR HIGHWAY ACCESS TO THE NORTH

Strategic Option Label	Component labels	Description
HW_N_1	H-N1	Quy interchange
HW_N_2	H-N1 + H-N2	Quy interchange and new junction
HW_N_3	H-N1 + H-N3	Quy interchange and Fen Ditton and new link
HW_N_4	H-N2 + H-N4	New junction and close Fen Ditton slip roads

Options for public transport and highways to the South and Southern Fringe (PT_S? and HW_S?)

2.30 It was decided to complete the review of options for PT access, and so attention turned to PT_S?, public transport access to the south. Table 2.10 sets out the options identified. As before, the labels correspond to numbered items on the wall-map used at the workshop.

TABLE 2.10 OPTIONS FOR PUBLIC TRANSPORT ACCESS TO THE SOUTHERN FRINGE (PT_S?)

DA	Option	Label
PT_S?	Perne Road	B-S1
	Cherry Hinton	B-S2
	New South link	B-S3
	Route via Centre	B-S4

2.31 Finally, options for highway links to the southern fringe were considered. Three potential options were identified.

TABLE 2.11 OPTIONS FOR HIGHWAYS ACCESS TO THE SOUTH AND SOUTHERN FRINGE (HW_S?)

DA	Option	Label
HW_S?	Perne Road capacity enhancements	H-S1
	Cherry Hinton capacity enhancements	H-S2
	New southern relief road	H-S3
	Do nothing	H-S4

2.32 This concluded progress made at the workshop.

3. WORK FOLLOWING ON FROM WORKSHOP

Introduction

3.1 This section describes work undertaken in a follow-up session run with Steer Davies Gleave staff on the study team. This work reviewed the outputs of the original workshop, and then extended it to look more closely at the options.

Review of the Decision Areas

3.2 The Decision Areas (DAs) and the options within them were carefully reviewed and the following changes made.

3.3 The options for public transport access to the city centre were modified slightly:

- It was decided that bus priority on Mill Road (B-C4) was not a practical option, due to lack of road capacity, and this was deleted from the list;
- On the other hand, option B-C5, providing a southern access to the centre was brought back in as an option. Following the workshop, consultations with other stakeholders introduced the idea of providing an “eastern approach” to Cambridge rail station, possibly via Davy Road. This could enable taxi, car drop-off, cycle, walk or bus passengers from east of the railway to be dropped off without requiring them to cross the railway on congested highway (i.e. Hills Road / Mill Road). A bus service could be run along Davy Road and then onto Hills Road and onwards to the rail station/city centre/Addenbrooke’s via the southern bus guideway;
- A new option, B-C7, was introduced. This is for buses exiting Cambridge East opposite Coldhams Common to run northwards along Barnwell Road to rejoin the western section of Newmarket Road. This provides a more direct route into phases 2 and 3 of the development, if required to travel by Newmarket Road and also avoids a more congested section of Newmarket Road directly to the east (Barnwell Road to Fen Ditton Road junctions).

3.4 The revised list is given in Table 3.1.

TABLE 3.1 REVISED OPTIONS FOR PUBLIC TRANSPORT ACCESS TO THE CITY CENTRE (PT-CC?)

DA	Option	Label
PT-CC?	Bus segregation on Newmarket Road	B-C1
	Bus segregated way on Coldham’s Common (either along northern edge or parallel to railway)	B-C2 / B-C2*
	Coldham’s Lane	B-C3
	Bus priority Mill Road	B-C4
	Cherry Hinton Road or Davy Road to Hills Road / railway station and into centre	B-C5
	Busway parallel to Railway	B-C6
	Barnwell Road plus western Newmarket Road	B-C7

Bold italicised text indicates revisions

3.5 It was also noted that B-C2 and B-C2* are strictly alternatives to each other. They both provide routes across Coldhams’s Common, but only one of them would be built. However, for the purposes of a strategic review at this stage, they can be considered as one option, B-C2.

3.6 The strategic options for PT access to the city centre were also revised slightly:

- PT_CC_4, which had previously been bus segregation on Newmarket Road on its own, became bus segregation on Newmarket Road (to serve phase 1) plus B-C7, Barnwell Road (to serve phases 2 and 3).
- A new option was added to the list, consisting of bus segregation on Newmarket Road plus the southern access option, B-C5.

3.7 The revised list is given in Table 3.2.

TABLE 3.2 REVISED STRATEGIC COMBINATIONS OF OPTIONS FOR PT ACCESS TO CITY CENTRE

Strategic Option Label	Component labels	Description
PT_CC_1	B-C1 + B-C2/B-C2*	Combination of bus segregation on Newmarket Road and a segregated busway on Coldham’s Common.
PT_CC_2	B-C1 + B-C3	Combination of bus segregation on Newmarket Road and a new service along Coldham’s Lane
PT_CC_3	B-C2/B-C2*	Segregated busway on Coldham’s Common
<i>PT_CC_4</i>	<i>B-C1+B-C7</i>	<i>Bus segregation on Newmarket Road plus Barnwell Road.</i>
<i>PT_CC_5</i>	<i>B-C1+B-C5</i>	<i>Bus segregation on Newmarket Road plus a southern access route.</i>

Bold italicised text indicates revisions

3.8 No changes were made to the options for PT access to the Northern Fringe

3.9 No changes were made to the highway options for access to the Northern Fringe, but the strategic options were altered:

- HW_N_2, previously comprising the Quy interchange and a new A14 junction was extended to include closure of the Fen Ditton slip roads;
- A new strategic option consisting of Fen Ditton plus a new link was introduced;
- A further option of ‘do nothing’ was introduced.

3.10 Table 3.3 lists the revised options.

TABLE 3.3 REVISED STRATEGIC COMBINATIONS OF OPTIONS FOR HIGHWAY ACCESS TO THE NORTH

Strategic Option Label	Component labels	Description
HW_N_1	H-N1	Quy interchange
<i>HW_N_2</i>	<i>H-N1 + H-N2 + H-N4</i>	<i>Quy interchange and new junction and close Fen Ditton slips</i>
HW_N_3	H-N1 + H-N3	Quy interchange and Fen Ditton and new link
HW_N_4	H-N2 + H-N4	New junction and close Fen Ditton slip roads
<i>HW_N_5</i>	<i>None</i>	<i>No highway improvements</i>
<i>HW_N_6</i>	<i>H-N3</i>	<i>Fen Ditton plus new link road.</i>

Bold italicised text indicates revisions

- 3.11 The PT options for access to the south were left unchanged except for a variation in PT_S4, previously a route from CE to the south via the centre, as proposed by the representative of the bus operator at the workshop, was redefined as a route via the station (Perne Road and then either Davy Road or Cherry Hinton Road to Hills Road) and then onwards to city centre or southern fringe via the bus guideway.
- 3.12 The four PT options corresponded to the strategic options for PT access to the south. In other words it was judged that they provided a representative set of alternative and mutually exclusive proposals. They are listed in Table 3.4.

TABLE 3.4 REVISED STRATEGIC COMBINATIONS OF OPTIONS FOR PUBLIC TRANSPORT ACCESS TO THE SOUTHERN FRINGE (PT_S?)

Strategic Option Label	Component labels	Description
PT_S1	Perne Road	Bus priorities along Perne Road
PT_S2	Cherry Hinton	Bus priorities through Cherry Hinton
PT_S3	New South link	A busway along the proposed new southern link road
PT_S4	Route via station	A route from CE to the station and then by busway to the southern fringe.

- 3.13 No changes were made to the options for Highways access to the Southern Fringe.

Comparison Areas

- 3.14 The table of Comparison Areas (CA's) was re-organised and extended (Table 3.5). The CAs were grouped under four broad themes: policy objectives, transport outcomes, environmental impacts and financial implications. Additional policy criteria were added, namely support for LTTS/LTP; compatibility with phasing of Cambridge East and local need, referring to whether transport infrastructure provision is likely to encourage long-distance commuting/use of Cambridge East housing by non-local need. Under transport policy CA's we grouped the three mode share objectives (PT mode share, car mode share and walk/cycle mode share) into one category to avoid double counting.
- 3.15 Table 3.5 overleaf shows this revised list of comparison areas, together with definitions and ways of measuring them. Within the workshop a rapid assessment of the strategic options was made in which each option was assessed against the alternative of 'do nothing'. A numeric scale of -5 to +5 was used, with positive values signalling a balance in favour of the option, compared to do nothing, and negative values indicating a balance against the option:
- 5 indicates 'extreme'
 - 4 indicates 'considerable'
 - 3 indicates 'significant'
 - 2 indicates 'marginal'
 - 1 indicates 'negligible'
 - 0 indicates neutrality.
- 3.16 Two of the environmental objectives were not scored. Air quality (Environ-AQ) was discounted as it was considered that there would be little discernible difference between different options in terms of overall emissions and that impact on mode share was also reflected through the mode share criterion. Flood plain (Environ-FP) was also discounted because it was felt that any negative impact on the flood plain was completely unacceptable and so mitigating measures would have to be provided for any scheme using floodplain: hence, negative impacts of these schemes would be reflected in added cost and amenity criteria (for example, if a public transport alignment has to be constructed on stilts across flood plain).

TABLE 3.5 COMPARISON AREAS

Label	Definition	Measure	Unit
Policy			
Political	Political Acceptability	Judgement about political acceptability (stakeholders views will be helpful in refining this)	Qual
Compliance	Compliance with Area Action Plan	Compatibility with Area Action Plan policies	Qual
Guided Bus	Complement Guided Bus proposals	Compatibility with guided bus proposals / potential to support further development of guided bus	Qual
LTTS	Long term transport strategy	Compatibility with long-term transport strategy and local transport plan objectives and policies.	Qual
Phasing	Compatible with phasing and development of Cambridge East	Scheme workable with current phasing plans (Y/N)	Qual.
Local need	Minimise encouragement of long-distance commuting, especially by car	Consideration of whether proposed transport links are likely to be encouraging to long-distance commuting in terms of highway access / access to rail network	Estimate change in travel-to-work patterns.
Environmental			
Environ-W	Impact on environment - Wildlife	Number of wildlife sites and LNRs impacted; scale of impact.	Enumerate sites & describe impacts.
Environ-Am	Impact on environment - Amenity	Number of greenspaces/areas of special landscape affected; no. of trees lost.	Enumerate sites & describe impacts..
Environ-AQ	Impact on environment - Climate Change & Air Quality	CO2 emissions. Modal split / congestion criteria used as proxies for this at the moment)	Car kms.
Environ-FP	Impact on environment – Flood Plain	Loss of floodplain / need for floodplain mitigation. Loss of floodplain is unacceptable. Therefore, any scheme with an impact on the floodplain will be fully mitigated and impact reflected in cost and amenity criteria.	Hectares.

Property	Acquisition / CPO / demolition	No. of households/industrial properties to be demolished, lose space (e.g. verges), lose amenity.	Count of houses.
Transport			
Cong-SR	Congestion on strategic roads	Traffic flows onto strategic network (predominantly A14, but also M11).	Vehicles/hr.
Cong-LR	Congestion on local roads	Traffic flows and congestion hotspots.	Vehicles/hr.
Modal share-MS	Modal share of car/pt/walk/cycle	Generate significant non-car use, to support 60% non-car mode share target.	Mode shares.
PT-CCC	PT Congestion in City Centre	Impact on bus levels (and capacity/congestion problems) in centre.	Estimated numbers of vehicles/hr
Financial			
PT-Revenue	PT financial viability	Is public transport option self-financing in long-term?	Qual./revenues and costs.
Cost	Financial viability / Cost	Capital costs.	Money.

Comparing Strategic Options

- 3.17 There are two possible ways of comparing strategic options:
- First, each individual option can be appraised individually in order to short-list preferred options;
 - Second, a compatibility matrix can be put together to identify options that fit together (for example, a public transport priority scheme on a particular road and increases in general highway capacity on the same road will be incompatible).
- 3.18 Where different options appear to be largely independent (such as options to the Northern Fringe), the first method has been used to short-list strategic options. Where there are large inter-dependencies (such as options to the Southern Fringe), the second method has been employed.
- 3.19 For reasons explained earlier, it was decided that walking/cycling options are broadly compatible with all highway and public transport options. Also, the nature of the walking and cycling network is such that, for each destination, it is legitimate to have several walking/cycling connections to allow penetration/dispersion of trips. Therefore, consideration of walking/cycling routes has been omitted from this strategic choice exercise. Our final recommendations will include a package of measures to maximise walking/cycling links to key destinations, whichever package of highway/public transport options is preferred.

Access to the City Centre

- 3.20 7 potential bus options were identified, of which two options were subsequently deleted. 5 packages of public transport measures were then identified where a combination of these individual options appeared to support each other well.
- 3.21 Table 3.6 shows a summary of the appraisal against the four broad assessment themes of policy objectives, transport outcomes, environmental impacts and financial implications. Each package was evaluated against various objectives within each category and given a score, as outlined above. These have been summarised to show their ranking in comparison to other schemes (a rank of 1 denotes the best performing scheme).

TABLE 3.6 RANKING OF PUBLIC TRANSPORT OPTIONS FOR CITY CENTRE

	PT_CC_1	PT_CC_2	PT_CC_3	PT_CC_4	PT_CC_5
Category	Seg New + Seg Cold	Seg New + Cold Ln	Seg CC	Seg New + Barnwell	Seg New + ORR + Station
Policy	2	5	1	3=	3=
Environment	5	3=	3=	1	2
Transport	1	4	2	3	5
Financial	5	3=	1=	1=	3=
Overall ranking	3	5	1=	1=	4

- 3.22 Two options score significantly better than the others and are taken forward to the short-listing stage, namely:
- Coldhams Common segregated busway;

- Newmarket Road segregated bus priorities and Barnwell Road to Newmarket Road.

3.23 It was noted that there were two highway capacity options: do nothing, or increase highway capacity along Newmarket Road for general traffic. The only potential option where highway capacity could be increased on Newmarket Road is Coldhams Common (PT_CC_3). It was considered that increasing highway capacity was not an overt aim of this strategy, so a package consisting of Coldhams Common plus additional highway capacity was not evaluated. However, should additional highway capacity towards the city centre become a useful option, Coldhams Common does potentially allow this.

Access to the Northern Fringe

3.24 For access to the north, where the long-list of options appear to be largely independent this first method was employed and so public transport options, then highways options were appraised individually to short-list.

Assessment of PT Strategic Options for access to the Northern Fringe

3.25 Table 3.7 sets out the summary scores for each option.

TABLE 3.7 RANKING OF PUBLIC TRANSPORT OPTIONS FOR NORTHERN FRINGE

	PT_N_1	PT_N_2	PT_N_3	PT_N_4
Bus option	A14 link	Chesterton busway	Railway route	Milton Rd
Policy	4	1=	1=	3
Environment	2	3	4	1
Transport	3	2	1	4
Financial	2	3=	3=	1
Overall ranking	4	1	3	2

3.26 One option, bus via the A14 is ruled out as it provides a poor level of service (considering the indirect routeing, congested network and poor access into the Northern Fringe). Two of the options, Chesterton busway and Railway route, present opportunities for major investment which could provide a step-change in public transport provision, supporting broader policies for developing a guided bus network throughout Cambridge. However, they both incur a significant environmental and financial cost. The final option, Milton Road, is via existing highways and incurs little cost but provides a much weaker level of service.

3.27 These three options are retained:

- Chesterton Busway;
- Railway route; and
- Milton Road service.

Assessment of Highways Strategic Options for access to the Northern Fringe

3.28 Table 3.8 sets out the summary scores for each option.

TABLE 3.8 RANKING OF HIGHWAYS OPTIONS FOR NORTHERN FRINGE

	HWAY_N_1	HWAY_N_2	HWAY_N_3	HWAY_N_4	HWAY_N_6
Highway option	Quy interchange	New junction	Fen Ditton and Quy interchange	New junction and Fen Ditton	Fen Ditton
Policy	1	4=	3	4=	2
Environment	1	4	5	2=	2=
Transport	5	3=	1	3=	2
Financial	3=	3=	2	3=	1
Overall ranking	1=	5	3	4	1=

3.29 Three options scored significantly better than the others, namely:

- Quy Interchange;
- Fen Ditton (a link road from Cambridge East to the existing Fen Ditton junction); and
- Fen Ditton plus Quy interchange.

3.30 The two options involving a new junction (at Honeyhill) were discounted. They provided few or no transport benefits offered by other schemes with considerably greater environmental and financial costs.

Combined Assessment of PT and Highways Strategic Options for access to the Northern Fringe

3.31 With these 3 highways and 3 public transport options remaining, a “compatibility matrix” was produced to assess whether any combinations of highways and public transport options were incompatible. It was concluded that the bus service via the A14 or the Chesterton busway could not be implemented with Quy interchange on its own, since traffic congestion would be likely to remain significant through Fen Ditton without a new link road. Therefore, these two options were removed and the 7 remaining combined public transport/highways options considered.

3.32 Table 3.9 sets out the summary scores for evaluating these options in combination.

TABLE 3.9 RANKING OF COMBINED PUBLIC TRANSPORT / HIGHWAYS OPTIONS FOR NORTHERN FRINGE

	HW1_PT4	HW3_PT1	HW3_PT2	HW3_PT4	HW6_PT2	HW6_PT3	HW6_PT4
Category	Quy interchange and Milton Rd bus	Quy, busway parallel to railway	Quy/Fen Ditton and Chesterton bus	Quy/Fen Ditton and Milton Rd bus	Fen Ditton and Chesterton bus	Fen Ditton and busway parallel to railway	Fen Ditton and Milton Rd bus
Policy	5=	1	2=	7	2=	2=	5=
Environment	1	5	6=	3	4	6=	2
Transport	7	1=	1=	5	4	1=	6
Financial	3	5	7	2	4	6	1
Overall ranking	2	3	7	5	4	6	1

3.33 Four options are retained as the best performers, namely:

- Fen Ditton and Chesterton bus;
- Fen Ditton and Milton Road bus;

- Quy interchange plus busway parallel to railway; and
- Quy interchange plus Milton Road bus.

3.34 These four short-listed options are retained for further examination in the next stage of the study.

Access to the Southern Fringe

3.35 For access to the south, it became apparent that the public transport and highways options were not independent, and it was necessary to assess combined options constructed from the public transport and highways options. The reason is that for example the option to increase general traffic capacity on Perne Road is incompatible with increasing bus capacity along the same corridor.

3.36 A compatibility matrix was developed to put the 4 public transport and 4 highways options against each other, resulting in 7 options taken forward for appraisal:

- HW1_PT2: Perne Road general traffic capacity enhancements plus bus service via Cherry Hinton corridor;
- HW2_PT1: Perne Road bus enhancements plus general traffic capacity enhancements via Cherry Hinton;
- HW2_PT4: Cherry Hinton general traffic capacity enhancements plus a new bus service via Perne Road / rail station and guideway to Southern Fringe;
- HW3_PT1: Southern Relief Road plus a new bus service via Perne Road;
- HW3_PT2: Southern Relief Road plus a new bus service via Cherry Hinton;
- HW3_PT3: Southern Relief Road plus a new bus service via the Southern Relief Road;
- HW3_PT4: Southern Relief Road plus a new bus service via Perne Road / rail station and guideway to Southern Fringe;

3.37 The evaluation of these combined options is shown in Table 3.10 below.

TABLE 3.10 RANKING OF COMBINED PUBLIC TRANSPORT / HIGHWAYS OPTIONS FOR SOUTHERN FRINGE

	HW1_PT2	HW2_PT1	HW2_PT4	HW3_PT1	HW3_PT2	HW3_PT3	HW3_PT4
Highway option	Perne Road	Cherry Hinton	Cherry Hinton	Southern Relief	Southern Relief	Southern Relief	Southern Relief
Bus option	Cherry Hinton	Perne Road	via station	Perne Road	Cherry Hinton	Southern Relief	via station
Policy	3=	2	1	7	6	5	3=
Environment	2=	2=	1	4=	4=	4=	4=
Transport	6=	6=	5	2=	2=	1	4
Financial	2=	2=	1	5=	5=	7	4
Overall ranking	3	2	1	7	6	5	4

3.38 Three options scored better than the others, namely:

- Cherry Hinton traffic capacity enhancements plus a bus service via Perne Road, railway station and guideway;
- Cherry Hinton traffic capacity enhancements plus a bus service via Perne Road;

and

- Perne Road general traffic capacity enhancements, plus a bus service via Cherry Hinton.

3.39 These three short-listed options are retained for further examination in the next stage of the study. All options involving a Southern Relief Road were deleted, as these schemes showed fewer benefits at significant additional environmental and monetary costs. This is not to say that a Southern Relief Road should be ruled out, but that for the purposes of promoting sustainable travel from Cambridge East, the Southern Relief Road does not appear to contribute as well as other options. However, further detailed traffic modelling in the next stage of the study will enable more detailed assessment of levels of congestion / ability to run reliable bus services by alternative routes without the Southern Relief Road.

Conclusions

3.40 It is possible, using the Strategic Choice method, to carry out further iterations of these appraisals, by putting the combined highway/public transport options for Northern Fringe, City Centre and Southern Fringe against each other and evaluating these combinations. However, at this stage, the options to serve the different destinations appear to be reasonably independent and the scores for short-listed options are fairly close. Therefore, it is judged that it will be better to keep these options in the next stage of study where more detailed technical work will allow the benefits and drawbacks of particular solutions to be investigated in more detail.

ANNEX A
EXPLANATION FOR DISCARDED OPTIONS

A1. EXPLANATION OF DISCARDED OPTIONS

Table A1: Explanation for reasons why options / combinations ruled out

1) Options ruled out prior to appraisal stage		
Option	Description	Explanation
Public transport towards the city centre		
B-C4	Bus priority on Mill Road	Ruled out on practicality grounds: Mill Road is a very restricted corridor in a busy residential area with a local district centre. Congestion is already problematic and the bus operator views this corridor as one of the most unreliable in Cambridge. In theory, it would be possible to provide bus priority through a one-way system or a bus-gate, but the busy residential area of this plus complex access arrangements that would ensue make us deem this impracticable.
B-C6	Busway parallel to railway, between Newmarket Road and rail station	Previous research carried out in association with Cambridgeshire Guided Bus has examined the opportunity of running a busway on railway land parallel to the railway between the rail station and Newmarket Road. The railway industry has always opposed this due to safety and operational reasons and the scheme would require their approval.
B-C8 (not shown)	Busway via edge of Fen Ditton Meadow	Ruled out on environmental grounds and effectiveness grounds before strategic choice process. Fen Ditton is environmentally sensitive. Houses at the urban edge look out onto the Meadow and a busway running next to the houses would be a significant intrusion. This alignment also does not provide good direct access to phases 2 and 3 of Cambridge East south of Newmarket Road, and the route would only be useful for circa 25% of the development.

2) Packages ruled out at appraisal stage		
Option	Description	Explanation
Public transport towards the city centre		
PT_CC_1	Segregated Newmarket Road and Segregated Coldhams Common	Full segregation of entire length of Newmarket Road plus Coldham Common route are duplicating.
PT_CC_2	Segregated Newmarket Road and Coldhams Lane	Newmarket Road adjudged not to provide sufficient public transport access on its own (due to capacity / reliability corridors along that corridor, plus indirect access to the southern portions of Cambridge East development. Coldhams Lane considered not to provide sufficient possibility for bus priority and reliability to provide a bus route that gives good access to the southern portions of the development: to get any bus priority would require removing verge, trees and on-street parking from southern side of Coldhams Lane, but there would remain significant problems for bus priority between xx Road and Newmarket Road.
PT_CC_5	Segregated Newmarket Road, plus route via rail station	Route via railway station deemed to score more poorly than alternatives to city centre due to difficulty / added length of journey and limited opportunities for priority. However, this option has been retained for access to southern relief, so is going to be examined.
Public transport towards the Northern Fringe		
PT_N1	Bus route via A14 link	This option provides an inadequate quality of bus service because of its indirect route (with no intermediate destinations), the reliance on a congested stretch of highway (A14 and Milton interchange) and the poor access arrangements into the Northern Fringe. For low-cost bus solutions, it is felt that bus services via Milton Road provide a better service as they serve more destinations en route.
Highways towards the Northern Fringe and North		
HWAY_N_2	New junction at Honeyhill (with new link road to Airport Way)	This option has the most severe environmental impacts and cost implications of all options. But it also fails to address policy objectives and we believe would not be workable. Providing a new junction onto the A14, directly accessible to Cambridge East is likely to encourage the use of Cambridge East for long-distance strategic travel. The A14 is to be widened from Fen Ditton westwards. Giving access to the A14 east of this widening is therefore likely to cause congestion problems and would probably necessitate widening of the A14 to the new junction, further increasing environmental and financial costs. It is also highly doubtful whether the Highways Agency would allow this to happen, due to proximity to Quy interchange and opposition to new junctions onto the strategic network.

3) Packages ruled out at combined public transport and highway options appraisal stage		
Option	Description	Explanation
Public transport and highway combinations towards the Northern Fringe		
HW3_PT2	Quy interchange, Fen Ditton link, plus Chesterton busway	This option is ruled out because it performs no better than an option simply to upgrade the Fen Ditton link, implement the Chesterton guided bus, and therefore saves on cost and environmental impact by not necessitating any upgrade to Quy. At detailed model testing stage, the impact on Quy interchange and Newmarket Road will be assessed in more detail to ensure that Fen Ditton on its own is workable.
HW3_PT4	Quy interchange, Fen Ditton link, plus Milton Rd bus	Similar to HW3_PT1 above, this requires significant highway infrastructure whilst providing a very limited bus improvement. Subject to detailed modelling testing we see no reason why an option involving Fen Ditton only plus a Milton Road bus would not be able to deliver the same level of benefits with reduced cost and environmental implications.
HW6_PT3	Fen Ditton link plus busway parallel to railway	Fen Ditton plus Chesterton busway provides a synergy (in as much as busway can take advantage of new link road as far as Fen Ditton). However, a new busway along the railway plus a new link road provides limited additional benefit with significantly greater financial and environmental costs. The busway parallel to the railway plus Quy interchange remains in.
Public transport and highway combinations towards the Southern Fringe		
HW3_PT1	Southern Relief Road; Perne Road bus priority	Ruled out due to cost and environmental implications of Southern Relief Road (<i>in relation to providing access from Cambridge East to the Southern Fringe, and at the same time promoting alternatives to the car</i>).
HW3_PT2	Southern Relief Road; Cherry Hinton bus priority	Ruled out due to cost and environmental implications of Southern Relief Road (<i>in relation to providing access from Cambridge East to the Southern Fringe, and at the same time promoting alternatives to the car</i>).
HW3_PT3	Southern Relief Road; bus via Southern Relief	Ruled out due to cost and environmental implications of Southern Relief Road (<i>in relation to providing access from Cambridge East to the Southern Fringe, and at the same time promoting alternatives to the car</i>).
HW3_PT4	Southern Relief Road; bus route via railway station and Trumpington guideway	Ruled out due to cost and environmental implications of Southern Relief Road (<i>in relation to providing access from Cambridge East to the Southern Fringe, and at the same time promoting alternatives to the car</i>).

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