Economic Prioritisation of the Greater Cambridge City Deal

A Transport Economic Assessment Report (TEAR) for Cambridgeshire County Council

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Contents

Executive Summary

- This report is the result of a study undertaken by Cambridge Econometrics and SQW for Cambridgeshire County Council, to prioritise the transport schemes in the Greater Cambridge City Deal on the basis of their economic impact.
- The Greater Cambridge City Deal is very important not just for the future of the Cambridge area, but also for the wider national economy. Crucially, it is providing a basis for significant infrastructure investment which ought to enable a new wave of innovation-led growth.
- The Deal is subject to a Gain Share mechanism, whereby £400m of Central Government funding in the 10-15 years after 2019 is dependent on the delivery of significant economic impacts through the prioritised spending of an initial £100m of funding over 2015-19.
- The study has focused on the impacts of the transport schemes in Greater Cambridge on the key metrics of housing and employment.
- A series of logic chains have been developed to assist with the quantitative assessment of how key housing and employment sites in Greater Cambridge are dependent on the City Deal transport schemes. These reflect the direct impacts of the schemes on housing, and direct and indirect (e.g. through better functionality of the city and its surrounds, or agglomeration effects) impacts on employment.
- Based on the logic chains, a quantified 'Economic Prioritisation Tool' has been developed which takes user-input assumptions on factors such as how critical each transport scheme is to a particular housing or employment development, and results in a prioritised list of the schemes based on their impact on housing or employment in a particular period (up to 2019, 2024 or 2031).
- The economic prioritisation is based on the trajectories for housing and employment in the Annual Monitoring Reports and emerging Local Plans for Cambridge and South Cambridgeshire, and a high level assessment of the importance of the City Deal transport schemes reflecting the Transport Strategy for Cambridge & South Cambridgeshire. It does not comment on or consider the housing trajectory or transport schemes in terms of deliverability. Nor does it seek to identify the infrastructure likely to be needed *ahead* of development - it aims to identify the likely economic benefits of having such infrastructure in place and how that is likely to support employment and housing growth.
- Sensitivity analysis has been undertaken to assess the sensitivity of the results to particular assumptions, and the overall results were found to remain similar in each case.
- The prioritisation is based on economic impacts only, and does not take into account the deliverability of the transport schemes. Cambridgeshire County Council will look at the issue of deliverability separately.
- The prioritisation based on total employment impacts and on direct housing impacts are shown in Table 1 and Table 2 respectively.

Table 1: Prioritisation on cumulative total employment impact in 2031

Rank	Scheme
1	Milton Road bus priority
2	Madingley Road bus priority
3	City centre capacity improvements/Cross-city cycle improvements
4	A428 to M11 segregated bus route/A428 corridor Park & Ride
5	A1307 Bus priority/A1307 additional Park & Ride
6	Histon Road bus priority
7	Saffron Walden & Haverhill pedestrian/cycle routes
8	Western orbital
9	Chisholm Trail cycle links/Chisholm Trail bridge
10	Project Cambridge - Hills Road
11	A10 dualling and junctions/A14/A10 Milton Interchange
12	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway
13	Bourn Airfield/Cambourne Busway
14	Waterbeach new station
15	Airport Way Park & Ride
16	Hauxton Park & Ride
17	Hauxton-Trumpington Busway
18	Newmarket Road bus priority
19	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway
20	Waterbeach cycle/pedestrian routes
21	Bourn Airfield/Cambourne cycle routes
22	Cambridge to Royston cycle link
23	Foxton level crossing and interchange

Table 2: Prioritisation on cumulative housing impact in 2031

Rank	Scheme
1	Milton Road bus priority
2	Histon Road bus priority
3	A428 to M11 segregated bus route/A428 corridor Park & Ride
4	Madingley Road bus priority
5	Bourn Airfield/Cambourne Busway
6	Newmarket Road bus priority
7	Airport Way Park & Ride
8	Bourn Airfield/Cambourne cycle routes
9	Waterbeach cycle/pedestrian routes
10	A10 dualling and junctions/A14/A10 Milton Interchange
11	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway
12	Waterbeach new station
13	Chisholm Trail cycle links/Chisholm Trail bridge
14	A1307 Bus priority/A1307 additional Park & Ride
15	City centre capacity improvements/Cross-city cycle improvements
16	Saffron Walden & Haverhill pedestrian/cycle routes
17	Project Cambridge - Hills Road
18	Foxton level crossing and interchange
19	Hauxton Park & Ride
20	Cambridge to Royston cycle link
21	Hauxton-Trumpington Busway
22	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway
23	Western orbital

1 Introduction

1.1 Background to the study

Greater Cambridge City Deal

On 19th June 2014 the Greater Cambridge City Deal was signed following negotiations between the UK government and a partnership of local stakeholders including Cambridge City Council, South Cambridgeshire District Council, Cambridgeshire County Council, The University of Cambridge and the Greater Cambridge Greater Peterborough Local Enterprise Partnership.

Focus on infrastructure, housing and jobs

In general terms, Cambridge is an area which is mostly supply-constrained, as evidenced by issues such as rising house prices and increasing congestion. The aim of the city deal is to boost growth by easing some of these supply-side constraints by investing in transport infrastructure which will enable or facilitate, and accelerate the delivery of, planned development sites around Cambridge that will in turn help create over 33,000 new homes and 45,000 new jobs. It will also enable the delivery of 1,000 extra homes on rural exception sites.

Funds are phased over the coming 10-15 years

According to the agreement, an initial £100 million will be provided in the 5 years from April 2015, split into 5 equal payments. An additional £400 million will also be available depending on the impacts identified from the initial investments – this will be split into two tranches of £200 million, the first available from April 2020 while the second will be from April 2025. With local partners also committed to providing a further £500m from other sources such as developer contributions, this represents a total potential investment of £1 billion in local infrastructure.

Demonstration of impact is crucial to further release of funds

As mentioned above, there is a clear need to provide an evidence base through which the infrastructure investments can be seen to promote economic growth, otherwise future phases of funding may not be forthcoming. This involves both an *ex-ante* and an *ex-post* assessment:

- ex-ante because the choice and timing of infrastructure investments will be important if growth impacts are to be demonstrated, and
- ex-post because, ahead of the release of further funds the process will need to look backwards and assess what benefits have actually been accrued from the investments already made.

This study concerns the ex-ante part of the assessment.

1.2 Main purpose and objectives

Quantifying effect on houses and jobs growth

The main purpose of the study is to devise a methodology whereby the economic benefits of transport schemes being put forward under the Greater Cambridge City Deal can be compared and ranked on an objective basis. The main metrics[1] on which the transport schemes are to be compared are as follows:

- housing growth;

[1] Gross Value Added (GVA) was considered as a potential metric but its calculation, particularly at local level, is problematic and so more straightforward measures such as employment and housing that fit better with the city's local growth plans, were chosen.

- jobs growth (both directly created or indirectly influenced)

Other effects, that are of secondary consideration and so not included in the quantitative analysis, but are nonetheless worthy of mention, include quality of life and health improvements.

Timescales are also important

Alongside the need to provide numbers for employment and housing growth there is also a requirement to consider the associated timing of these benefits. It is not enough that a scheme delivers a large number of houses and jobs if the timescale involved is too long term for it to be included in the planning schedule.

Underlying assumptions

This study is based on the trajectories for housing and employment in the Annual Monitoring Reports and emerging Local Plans for Cambridge and South Cambridgeshire, and a high level assessment of the importance of the City Deal transport schemes reflecting the Transport Strategy for Cambridge & South Cambridgeshire. It does not comment on or consider the housing trajectory or transport schemes in terms of deliverability. Nor does it seek to identify the infrastructure likely to be needed *ahead* of development - it aims to identify the likely economic benefits of having such infrastructure in place and how that is likely to support employment and housing growth.

Remaining sections of the report

Chapter 2 describes the qualitative assessment of the transport schemes in terms of their strategic fit into the plans for the Cambridge area and the method through which the employment and houses can be allocated across schemes and to different time periods.

Chapter 3 develops the model further by quantifying the effects and developing a tool whereby the schemes can be ranked according to their employment and housing growth effects, allowing the user to modify assumptions and see how this affects the attractiveness of different scheme combinations.

Chapter 4 summarises the findings while the Appendices contain more detail on the transport schemes under consideration (Appendix A) and a map of the transport corridors in Greater Cambridge (Appendix B).

2 Qualitative Assessment

2.1 Introduction

The Greater Cambridge City Deal is very important not just for the future of the Cambridge area, but also for the wider national economy. Crucially, it is providing a basis for significant infrastructure investment which ought to enable a new wave of innovation-led growth. However the investment is premised – literally – on a "deal": the scale of that investment over 10-15 years will depend on delivering additional economic impact and growth. The City Deal document states that "the backbone of the proposed strategy is a transport network to link areas of population and employment within the City Deal area". The schemes identified to date comprise a mix of road capacity improvements, public transport prioritisation measures and pedestrian/cycle routes. All have a strong transport-related rationale (which has been tested through DfT's EAST process). However the City Deal's "bottom line" is fundamentally different from conventional DfT metrics[2]: it relates to the delivery of additional economic growth over the period to 2031.

However, although it is clear that there is a relationship between investment in transport infrastructure and the process of both economic (jobs) and housing growth, identifying the extent of causality is very difficult. In the main, transport economists have relied on measures of travel-related time savings as a proxy for economic performance and some monetary value has been attached to this. However in practice, the link to the conventional metrics of economic growth – the creation of new jobs and the construction of new houses – is really quite uncertain. In 2013, DfT commissioned an independent study to "review methods for modelling and appraisal of the sub-national, regional, and local economy impacts of transport". This examined different approaches to transport modelling. It concluded that "there is currently no suitable method in its current form that could be widely used to meet all requirements for accurately estimating sub-national, regional and local economy impacts."

It was from this premise that Cambridge Econometrics and SQW – two Cambridge-based firms – embarked on a more qualitative consideration of possible/probable impacts relating to the process of economic growth.

Our starting point was, literally, a map showing the principal transport routes across (and beyond) Cambridge; the planned housing schemes; and major areas of planned employment growth. Onto this map, we plotted the transport schemes identified through the City Deal process, and we considered – in a highly narrative form – the role(s) that each plausibly might play in either enabling or accelerating the creation of new jobs and homes. This narrative was then converted into a series of structured logic models; and the relationships within the models were, as far as possible, then quantified to provide some basis for economic prioritisation. This chapter explains the first part of this process.

[2] This does not negate the need for ex-ante appraisal using existing methodologies, in line with HM Treasury's *The Green Book Appraisal and Evaluation in Central Government* and Guidance on Appraisal and the DfT's Transport Analysis Guidance (webTAG).

2.2 The transport dimensions of Greater Cambridge's 'economic masterplan'

Continuing growth within the current spatial footprint of Greater Cambridge is crucially important for the UK economy, yet the area is – evidently – highly congested: the road network is under huge pressure and public transport (rail, bus) is also close to capacity. Within this context, additional transport investment ought to stimulate economic and housing growth. Plausibly, this is most likely to arise when the new investment is:

- clearly crucial to unlocking major housing and/or employment sites (which would not otherwise come forward)
- providing an important link between employment and housing development sites
- enhancing the functionality of the city centre and its surrounds, recognising that this is a major hub of economic activity in its own right, and the main retail, entertainment and service centre for a much wider area
- improving perceptions of Cambridge as a place to do business and to enjoy a good quality of life.

All four of these circumstances are found within the Cambridge area. In the paragraphs that follow, we explain each in turn.

Unlocking major housing and/or employment sites

In some respects, the most unambiguous arguments surrounding the role of transport schemes in delivering growth relate to those circumstances in which developments simply will not proceed without upfront investment in some part of the transport infrastructure. This is generally because of issues relating to direct site access, or to the capacity of transport routes which serve the site (e.g. the full development of Northstowe cannot proceed until a new link road to the A14 and the A14 improvements are in place).

There are examples of such schemes in the transport investment proposals identified through the City Deal process functioning literally as an on/off switch for housing and/or employment growth (e.g. improvements to the A10 to enable the development of the proposed housing and employment development at Waterbeach). While a high level assessment has been undertaken of direct and indirect benefits of proposed transport schemes here, this does not constitute a detailed transport assessment which will be required to ascertain specific implications of growth and the interventions needed to mitigate that growth.

Linking employment and housing sites

A key aim of the City Deal is to enhance the functionality of the Cambridge area as a whole. Across Cambridge, housing is currently being sold as quickly as it is built and there are no discernible "cold spots". In relation to employment, however, the situation is rather more complex. There are, arguably, three main market areas which are faring quite differently:

- the central area – around the station and the city centre, is the most buoyant part of the employment-related market, and demand for sites and premises has consistently outstripped supply. The development of CB1 has temporarily increased supply, but the escalation of rents in this area demonstrates the scale of demand for business space
- elsewhere in the city – particularly to the south at Cambridge Biomedical Campus, the northern fringe and west Cambridge. Most of these sites have planning restrictions (in terms of more restrictive Use Class designations) but in general

demand is strong, based on key attractors (Addenbrooke's, Cambridge Science Park, etc). The main exception to date has been the West Cambridge site, which is perceived as being somewhat more remote from the railway station and city centre

- science and business parks in the surrounding area of south Cambridgeshire, such as Cambridge Research Park to the north, Granta Park to the south and Cambourne Business Park to the west. In these areas demand has picked up recently but it proved really quite sluggish during the economic downturn; it might therefore be regarded as significantly more cyclical than alternatives in and on the edge of the city.

Overlain on these three 'concentric rings' around Cambridge is a market bias in favour of areas to the south of the city relative to other segments. This is largely due to three factors: relatively the southern part of the area is closer to Cambridge station and to London, and most of the major research institutes are in this area.

Within this broad spatial context, it is apparent that transport investment has a potentially catalytic role to play by enhancing the relative attractiveness of some employment locations, by reducing journey times, and by increasing the capacity, reliability and accessibility of links between major housing and employment sites. For example, the bus priority schemes and additional park & ride facilities proposed for most of the main radial routes into Cambridge fall into this category.

Enhancing the functionality of the city centre and its surrounds

The city centre acts as the service centre for the whole of Greater Cambridge and a wider catchment area. It is also a major employment centre in its own right. The main radial routes all converge on the city centre, and some key public transport links pass through the centre (e.g. the guided bus). The city centre is also highly constrained by the historic buildings, open spaces and street pattern, and highly congested.

In addition, there are various major employment and housing sites on the edge of the city which need to be better linked. The guided bus has already improved north south links (e.g. between the Cambridge Science Park and the Addenbrooke's site, including the Cambridge Biomedical Campus) although its passage through the city centre is still capacity constrained. In addition, links between these locations and others to the east and west of the city centre (e.g. Capital Park, and the West Cambridge site) need improvement.

Measures to improve the capacity and reliability of movement across and around the city centre, particularly by public transport and cycling, are therefore crucial to the efficient functioning of the whole Greater Cambridge area, and specifically to linking housing sites to employment sites, and both to city centre services.

Improving perceptions of Cambridge

Cambridge is one of the most attractive places in the country to live and work. It has a high quality of life and a strong specialist labour market, and it has proved increasingly attractive to inward investment and to tourists.

However, a common concern among residents, businesses and visitors is traffic congestion, and the uncertainty and delays that this causes. If growth results in further increases in congestion and a decline in the quality of life, Cambridge will become less attractive and firms will begin to look elsewhere to locate and grow – typically looking outside the UK rather than elsewhere within the country.

Transport improvements are therefore essential to maintain and improve perceptions of the city and surrounding areas. The effect of any one improvement on perceptions of the area is impossible to measure, but over time there is likely to be a discernible

indirect effect on jobs and homes of all transport improvements considered together. And those that have the biggest impact on improving access to jobs and homes, and the links between them, are likely to have the biggest effect on perceptions.

2.3 Logic Chains

Tables 2.1 to 2.3 summarise the above arguments and relate them to the type and scale of impacts that can be expected of the proposed transport schemes, both individually and collectively, directly and indirectly.

Table 2.1: Direct effects linked to (A) housing developments and (B) new employment provision

Context	**1: Route to Impact (RtI)**	**2: Strength of the causal link to relevant developments**	**3: How much of the impact can the scheme claim***	**4: From the supply side perspective, how quickly will impacts be achieved, taking into account:** • **A: practicalities of scheme delivery; AND** • **B: delivery of relevant development sites**	**5: From the demand side perspective, how quickly is demand likely to materialise?**
The scheme is located in a growth corridor in which housing development is planned	A: The scheme will impact (to a greater or lesser extent) directly on the **development of a (specified) number of homes**	*Critical* – the development will not go ahead at all unless the scheme is delivered	100%	To be assessed separately	[N/A – assume there will be no shortage of demand for housing in Cambridge]
		Necessary – the scheme is important to enable the development to proceed (and to its connectivity to jobs in the Cambridge area)	60%		
		Priority – the scheme will significantly enhance the deliverability of the development	20%		
	AND/OR				
The scheme is located in a growth corridor in which employment sites have been allocated	B: The scheme will impact (to a greater or lesser extent on **development of allocated employment sites which will accommodate a (specified) number of jobs**	*Critical* – the development will not go ahead at all unless the scheme is delivered	100%	To be assessed separately	There may be variations in the strength of demand depending on the location of the scheme: in general, the closer to Cambridge city centre, the stronger the demand. However, variations are also likely due to other factors such as the economic cycle, therefore delay factors cannot be quantified
		Necessary – the scheme is important to enable the development to proceed (and to its connectivity to jobs in the Cambridge area)	60%		
		Priority – the scheme will significantly enhance the deliverability of the development	20%		

Note: * The scale of impact a transport scheme can claim will lie within a range, but to enable quantitative assessment, a single value has been proposed.

Table 2.2: Indirect effects relating to employment through the "functionality of the cluster"

Context	1: Route to Impact (RtI)	2: Strength of the causal link	3: How do we isolate (in quantitative terms) the impacts to which this relates?	4: How much of the impact can the scheme claim?	5: From the supply side perspective, how quickly will impacts be achieved, taking into account: • A: practicalities of scheme delivery; AND • B: delivery of relevant development sites	6: From the demand side perspective, how quickly is demand likely to materialise?
The scheme provides better links between two or more key "cluster sites"; and/or	The scheme will impact indirectly on the process of employment growth as a result, mainly, of **the better connectivity and functional integration of "cluster sites".** This will not impact on supply, but it could accelerate the growth in demand for new employment provision	The strength of the link depends on the role the scheme plays in the overall transport package, particularly along the relevant transport corridor	The number and scale of employment and housing sites in and related to the relevant transport corridor	The strength of the indirect effect of a particular scheme can be assumed to be related to its criticality	To be assessed separately	There may be variations in the strength of demand depending on the location of the scheme: in general, the closer to Cambridge city centre, the stronger the demand. However, variations are also likely due to other factors such as the economic cycle, therefore delay factors cannot be quantified
The scheme contributes to the accessibility /functionality of the city centre; and/or		The strength of the link is related to the contribution the scheme makes to improving accessibility to the city centre and the inclination of residents and employees to use its services (e.g. retail)	Planned growth of retail, culture, leisure, etc. in the city centre (which won't necessarily involve B Use Class employment land)			
The scheme contributes to orbital connectivity linking key destinations		The strength of the link is related to the contribution the scheme makes to improving accessibility to and between sites around the edge of the city (e.g. between West Cambridge and Addenbrooke's)	Planned growth of Greater Cambridge			

Table 2.3: Indirect effects relating to employment and/or housing through the "attractiveness of Cambridge"

Context	1: Route to Impact (RtI)	2: Strength of the causal link	3: How do we isolate (in quantitative terms) the impacts to which this relates?	4: How much of the impact can the scheme claim?	5: From the supply side perspective, how quickly will impacts be achieved, taking into account: • A: practicalities of scheme delivery; AND • B: delivery of relevant development sites	6: From the demand side perspective, how quickly is demand likely to materialise?
The scheme helps Cambridge work better – as a place where people live, work, shop and visit	The scheme will impact indirectly on both housing and employment growth simply because Cambridge is seen as an attractive place to be: congestion is reduced and travel is quicker and more reliable, which improves the quality of life	Weak – only one part of a much bigger range of issues	This relates to the long term growth of Cambridge as a whole. Scope for quantification very limited.	N/A	To be assessed separately	Quality of life related impacts must be long term. Cambridge is already highly congested and people are still wanting to live and work here. However, over the long term (e.g. 20 year+), if congestion is allowed to increase indefinitely, investment in the local economy will be deterred and people will no longer want to live here

3 Quantitative Assessment

3.1 Introduction

This part of the report describes how the strategic analysis and logic chains developed in the previous section have been developed further into a spreadsheet tool to quantify the economic impacts of the City Deal schemes. The tool has been developed through a number of discussions, both within the project team and with the client team. It is necessarily a simplification of reality, but incorporates what we believe to be the key economic impacts necessary to robustly prioritise the schemes.

The tool allows the housing, direct employment and indirect employment effects of developments across Greater Cambridge to be allocated across the different transport schemes and corridors, so that a comparison can be made and a ranking of schemes undertaken on the different metrics. The allocation of housing and/or employment at particular development sites to particular transport schemes is based on an assessment of how critical a transport scheme is to enabling or supporting development at each site. The ranking can be made for any particular time period, although the key dates for the City Deal are 2019, 2024 and 2031. The structure of the tool is outlined below, alongside key assumptions that have been made, and the outputs and findings are then discussed.

3.2 Structure of the spreadsheet tool

Overview The spreadsheet tool is laid out in six worksheets, each of which is described below.

Information sheet This describes the version and set-up of the tool, including information on what the other sheets contain and a description of what the main assumptions are.

Summary sheet The summary sheet presents the main results of the spreadsheet tool. It contains summary tables for the housing, direct employment and indirect employment impacts, for each transport scheme for three key periods. It also has embedded selection tools which allow the user to choose the year ((2019, 2024 or 2031) and indicator of interest to provide a single, more focussed, ranking.

Assumptions This sheet is where the underlying assumptions are stored, which can be altered by the user. A description of the assumptions is contained in the next section.

Direct Housing This sheet is used to calculate the direct housing impacts of each scheme, based on the figures in the assumptions sheet.

Direct employment This sheet is used to calculate the direct employment impacts of each scheme, based on the figures in the assumptions sheet

Indirect employment This sheet is used to calculate the indirect employment impacts of each scheme, based on the figures in the assumptions sheet.

Key assumptions Here the key assumptions that underpin the spreadsheet tool are discussed.

Grouping of assumptions At the highest level, the assumptions are grouped together according to the key ways in which the transport schemes are assumed to impact on economic growth, as discussed in Chapter 2 above. These are:

1. direct impacts on housing - reflecting the direct enabling/supporting of housing developments

2. direct impacts on employment – reflecting the direct enabling/supporting of employment sites
3. indirect impacts on employment – reflecting the linking of employment and housing sites and the enhanced functionality of the city centre and its surrounds

Grouping of schemes

Within each of the three types of impact, the assumptions are grouped together by development, with a row for the assumptions for each transport scheme relevant to each development. In some cases transport schemes have been grouped together where it would not make sense for one scheme to go ahead without the other (e.g. the A428 to M11 segregated bus route and the A428 corridor park and ride).

Many of the transport schemes have wider benefits outside of Greater Cambridge, and some help in facilitating growth further afield. For example, improvements to the A1307 corridor (such as the bus priority scheme and additional park & ride, and Saffron Walden & Haverhill pedestrian/cycle routes) should increase demand for affordable housing in Haverhill while at the same time supporting employment growth in Cambridge (especially on the Addenbrooke's site) by making it easier for workers to commute in from those developments. As the housing in Haverhill is outside of Greater Cambridge, it has not been included in the assessment of housing supported by City Deal transport schemes. However, the A1307 schemes will help support employment growth in Greater Cambridge, and so are included in that assessment.

Some of the transport schemes in the City Deal could impact, at least indirectly, on growth at the planned development at Northstowe, by alleviating congestion generally – in particular, by improving the reliability of the guided bus on the road sections of its route into central Cambridge. However, Northstowe already has planning permission for the first Phase (1,500 houses) of the development and some of these are due to be completed in 2015. The City Deal schemes cannot therefore be seen as being imperative to development proceeding. Housing and employment growth associated with Phase 1 of development at Northstowe has therefore been explicitly excluded from this prioritisation assessment. However, consideration of the impact of the transport schemes on future phases of development at Northstowe has been made.

For each development and transport scheme there are then various assumptions, which are described below.

Trajectory of development

For each development, a time profile of how that site is expected to be developed is specified based on the information available. For housing developments, these are as set out in the Annual Monitoring Reports for Cambridge City[3] and South Cambridgeshire[4]. For employment sites, the time profiles are those underlying the emerging Local Plans for Cambridge City and South Cambridgeshire. Sensitivity analysis of the result to bringing housing and employment developments forward by five years has been conducted (see 'Sensitivity Analysis' below), but no analysis has been undertaken to assess whether such development could actually be brought forward if the transport schemes were delivered sooner.

[3] https://www.cambridge.gov.uk/sites/www.cambridge.gov.uk/files/documents/FINAL%20AMR.pdf

[4] https://www.scambs.gov.uk/sites/www.scambs.gov.uk/files/documents/South%20Cambs%20AMR%202012-2013.pdf

Indirect employment

In order to assess the likely 'indirect' employment impacts of the various City Deal transport schemes, i.e. through improved connectivity and enhanced functionality of the city centre and its surrounds, it is necessary to have a measure of the scale of such employment. This has been calculated as the total employment growth set out for Greater Cambridge in the two emerging local plans, less the employment attributed directly to particular schemes. Thus, in this assessment, all employment growth provided for on land allocated in the emerging Local Plans has been attributed either directly or indirectly to the City Deal transport schemes. This is under the premise that, without the transport schemes, these sites are unlikely to provide any of the planned jobs. Although it could, perhaps, be argued that this assumption is an extreme one, it is not critical to the overall result of the analysis. Sensitivity testing of the result when ranking based on total employment (direct plus indirect) compared with ranking on direct employment only (See Chapter 4 below) shows that only the ranking of the Histon Road bus priority scheme is significantly affected.

Criticality for development

This assumption is used to show at a high level the importance of a transport scheme to the development. A scheme is 'critical' (4) if the development could not go ahead at all without it, 'necessary' (2) if it is important to enable the development to come forward in a sustainable manner, but not critical, and a 'priority' (1) if the scheme will significantly enhance the deliverability of the development within the context of relevant policy priorities. The numerical values represent the increasing importance of the schemes in terms of benefits, and a value of 4 (rather than 3) is used to represent 'critical' schemes to emphasise their importance relative to the other schemes (see Sensitivity Analysis, below, for analysis of the impact of using 4 rather than 3 for critical schemes, on the results).

The criticality assumptions are based on a high level assessment of the links between proposed schemes and planned growth by Cambridgeshire County Council, with advice from relevant officers. This assessment is based on and reflects what is included in the emerging Local Plans, Housing Trajectories and the Transport Strategy for Cambridge & South Cambridgeshire. This assessment does not consider the transport schemes in terms of deliverability or what infrastructure is likely to be needed *ahead* of development, nor does it preclude the need for detailed transport assessment work which will be required for developments to identify infrastructure requirements to facilitate and mitigate the impacts of growth.

Schemes that have been assessed as critical to particular housing developments are:

- Bourn Airfield/Cambourne West
  - A428 to M11 segregated bus route/A428 corridor park and ride
  - Madingley Road bus priority
- Cambridge East
  - Newmarket Road bus priority
  - Airport Way park & ride
- Waterbeach Barracks
  - Waterbeach cycle/pedestrian routes
  - Milton Road bus priority
  - A10 dualling and junctions/ A14/A10 Milton interchange
  - Waterbeach park & ride/ Waterbeach to North Cambridge Busway
  - Waterbeach new station

Schemes that have been assessed as critical to particular employment sites are:

- Bourn Airfield/Cambourne West
  - A428 to M11 segregated bus route/A428 corridor park and ride
  - Madingley Road bus priority
- Cambridge Northern Fringe East
  - Chisholm Trail cycle links/Chisholm Trail bridge
  - Milton Road bus priority
  - A10 dualling and junctions/ A14/A10 Milton interchange
  - Waterbeach park & ride/ Waterbeach to North Cambridge Busway
- Waterbeach Barracks
  - Waterbeach cycle/pedestrian routes
  - Milton Road bus priority
  - A10 dualling and junctions/ A14/A10 Milton interchange
  - Waterbeach park & ride/ Waterbeach to North Cambridge Busway
  - Waterbeach new station

Schemes that have been assessed as critical to indirect employment growth across Greater Cambridge are:

- City centre capacity improvements/ Cross-city cycle improvements
- Histon Road Bus priority
- Milton Road bus priority

Schemes such as the Waterbeach cycle/pedestrian routes, and Chisholm Trail cycle links/Chisholm Trail bridge are rated by the Council as critical to development at Waterbeach Barracks and Cambridge Fringe North East, respectively. This is because a very significant proportion of the trips to and from Cambridge generated by those developments would at least initially need to be by cycle or walking or public transport to enable any development, given the current lack of capacity, and building in congestion factors for North East Cambridge.

Causal link to development (scale of impact)

This is an intermediate calculation, based on the 'criticality' scores described above, that is used to calculate the proportion of housing or employment at a development that will be attributed to each scheme[5]. Each proportion is calculated as the criticality factor for that scheme and development divided by the sum of the criticality factors for all schemes relevant to that development. For example, if a scheme has a criticality score of 4 and the other schemes relevant to that development have values of 2, 1 and 1, say, then this scheme will be attributed 50% [4/(4+2+1+1)] of the housing/employment from that development.

Year of scheme completion

The tool assumes that the transport schemes have been completed by the beginning of the assessment period (2015): i.e. no account is taken of time required for planning, construction, etc.. This is to ensure complete separation of the economic prioritisation process from the assessment of deliverability of particular transport schemes. Cambridgeshire County Council will make their own assessment of deliverability to

[5] This calculation effectively computes the values for 'scale of impact' (as discussed in Section 2.3 above) based on the 'criticality factors'. The scale of impact a transport scheme can claim will lie within a range, but to enable quantitative assessment, a single value has been assigned.

accompany the economic prioritisation. However, this field allows that assumption to be changed.

Delay factor

The qualitative analysis in Chapter 2 discusses that even when a transport scheme relevant to a particular development is completed, there may be a delay in the take-up of housing or creation of employment. This assumption can be set to take that into account.

For housing, it is argued that in Greater Cambridge (and especially in Cambridge itself), demand is so high that there is unlikely to be any delay in take-up, and so this assumption should be set to zero. For employment creation there is more of a case for arguing that, once an employment site has been developed and relevant transport schemes have been completed, there may be a delay in businesses moving onto the site. However, although an assessment could be made of what that delay factor should be for each development, it would be relatively uncertain (e.g. it would be likely to vary depending on the stage of the economic cycle). Although we do want to be able to assess the cumulative impact of each scheme at a particular point in time, it was felt that, because of the uncertainty surrounding the delay factors, and the fact that the different assumptions entered would only vary by a few years (and so make little difference in the medium to long term), the delay factors for schemes relating to employment sites should also be set to zero.

Overall contribution of transport schemes to development

This assumption is used to include an assessment of how much of the development at each site can be attributed directly to the transport schemes, rather than indirectly (through better 'functionality' / wider connectivity impacts, say). For example, if all the transport schemes relevant to a development are critical, then we might attribute 100% of the housing/employment directly to the schemes, but if all the schemes were only graded as 'priority' then we might attribute only 20% of the housing/employment directly. The rules applied are: all schemes are 'critical' = 100%; Mix of 'critical' and others = 80%; All 'necessary' = 60%; Mix of 'necessary' and 'priority' = 40%; all 'priority' = 20%.

Adjustment for 'optimism bias'

Beyond the 'Overall contribution to direct employment' assumption, this option allows the user to make a further assumption about the amount of housing or employment that can be attributed directly to the transport schemes. This is, in effect, a sort of 'optimism bias' adjustment, to make sure we don't over-estimate the likely direct impacts of each scheme. However, sensitivity analysis (see below) has shown that the results are not particularly sensitive to this assumption, and so it was set to zero for the default option.

3.3 Main outputs

The main outputs from the tool are found on the Summary sheet within the spreadsheet tool. This contains the list of transport schemes alongside their expected housing, direct, indirect and total jobs impacts, and a combined 'housing plus total jobs' indicator, for the three key years of 2019, 2024 and 2031. The user can then choose to rank the schemes on any of the above. It should be noted that, whilst all new jobs are accounted for in this analysis as those that are not directly impacted upon by the transport schemes are considered under 'indirect employment' impacts, not all new houses are accounted for. This is because the housing market does not lend itself to the same consideration of indirect impacts as the employment market, particularly in terms of agglomeration impacts for instance. The 'direct housing' and 'total

employment' numbers therefore show slightly different things, so do not demonstrate like-for-like impacts.

Sensitivity analysis

A range of sensitivity analysis has been undertaken to look at how sensitive the baseline results are to changes in particular assumptions. These are summarised below.

Relative weight of 'critical' schemes

Sensitivity of the results to using a value of 4 rather than 3 for 'critical' schemes was undertaken, and although the housing/employment attributed to critical schemes increases (when 4 is used for critical) and that attributed to schemes that are only graded as 'necessary' or 'priority' decreases (as would be expected, given the change in relative weight) the ranking of the schemes remains similar (See Table D.1 in Appendix D).

Optimism bias

Sensitivity of the results to the alternative assumptions that a further (over and above the assumption made under 'Overall contribution of transport schemes to development') 0%, 20% and 30% of housing/employment at a development site should be attributed indirectly to the transport schemes was tested. This test also effectively tests the sensitivity of the results to alternative (lower) assumptions for 'Overall contribution of transport schemes to development', as the implied direct contribution of the transport schemes to a development is a combination of these two assumptions. The result was found to remain broadly unchanged, with the top five schemes remaining in the top five under each assumption. (See Table D.2 in Appendix D).

Development trajectories brought forward five years

Further sensitivity analysis was carried out to look at the impact on the ranking of bringing the time profiles of the various developments forwards by five years. This was to allow for the fact that the current time profile (in the Annual Monitoring Reports and emerging Local Plans) for some developments is such that they are not expected to start being developed in the short or medium term, but in fact bringing transport schemes forward might allow delivery of some developments also to be brought forwards. The ranking of the schemes was found to remain almost identical after bringing the delivery of developments forward (See Table D.3 in Appendix D).

4 Key findings

Total employment and housing

Tables 4.1-4.2 below show the economic prioritisation of the City Deal transport schemes, based on the assumptions described in Chapter 3 above, using cumulative (i.e. 2015-2031) impacts in 2031, for total employment and housing impact respectively.

As discussed previously, the prioritisation does not take into account deliverability of the transport schemes, as Cambridgeshire County Council will make a separate assessment of that. The values (employment or housing) associated with each scheme are based on various assumptions, including current trajectories for employment and housing development as published in the emerging Local Plans and the Local Authorities' Annual Monitoring Reports. They give an overall indication of the *scale* of impact, in order to be able to prioritise the schemes, but individual numbers should not be read as an *exact* estimate of the expected impact of each scheme.

Given the focus on employment and housing respectively, it is not surprising that the ranking of the schemes under the two measures are quite different (many of the schemes will not impact directly on housing). However, the Milton Road bus priority scheme ranks as the top scheme under both measures due to its importance to various housing (Waterbeach Barracks) and employment development (Cambridge Northern

Table 4.1: Prioritisation on cumulative total employment impact in 2031

Rank	Scheme	Employment
1	Milton Road bus priority	3589
2	Madingley Road bus priority	3004
3	City centre capacity improvements/Cross-city cycle improvements	2739
4	A428 to M11 segregated bus route/A428 corridor Park & Ride	2668
5	A1307 Bus priority/A1307 additional Park & Ride	2216
6	Histon Road bus priority	1690
7	Saffron Walden & Haverhill pedestrian/cycle routes	1666
8	Western orbital	1471
9	Chisholm Trail cycle links/Chisholm Trail bridge	1412
10	Project Cambridge - Hills Road	1298
11	A10 dualling and junctions/A14/A10 Milton Interchange	1275
12	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	1275
13	Bourn Airfield/Cambourne Busway	1225
14	Waterbeach new station	1050
15	Airport Way Park & Ride	963
16	Hauxton Park & Ride	788
17	Hauxton-Trumpington Busway	788
18	Newmarket Road bus priority	780
19	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	739
20	Waterbeach cycle/pedestrian routes	737
21	Bourn Airfield/Cambourne cycle routes	613
22	Cambridge to Royston cycle link	551
23	Foxton level crossing and interchange	314

Fringe East and Waterbeach Barracks) sites. Similarly, the Madingley Road bus priority and A428 to M11 segregated bus route/A428 corridor Park & ride both rank within the top four schemes under both measures, given the importance of the Bourn Airfield/Cambourne developments to both employment and housing. Cambridgeshire County Council will combine the rankings under the two measures to give an overall ranking for prioritisation which also includes consideration of deliverability.

Table 4.2: Prioritisation on cumulative housing impact in 2031

Rank	Scheme	Housing
1	Milton Road bus priority	1433
2	Histon Road bus priority	1331
3	A428 to M11 segregated bus route/A428 corridor Park & Ride	844
4	Madingley Road bus priority	844
5	Bourn Airfield/Cambourne Busway	422
6	Newmarket Road bus priority	378
7	Airport Way Park & Ride	378
8	Bourn Airfield/Cambourne cycle routes	211
9	Waterbeach cycle/pedestrian routes	204
10	A10 dualling and junctions/A14/A10 Milton Interchange	204
11	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	204
12	Waterbeach new station	204
13	Chisholm Trail cycle links/Chisholm Trail bridge	189
14	A1307 Bus priority/A1307 additional Park & Ride	115
15	City centre capacity improvements/Cross-city cycle improvements	95
16	Saffron Walden & Haverhill pedestrian/cycle routes	57
17	Project Cambridge - Hills Road	0
18	Foxton level crossing and interchange	0
19	Hauxton Park & Ride	0
20	Cambridge to Royston cycle link	0
21	Hauxton-Trumpington Busway	0
22	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	0
23	Western orbital	0

Direct employment

Table 4.3 shows the ranking if using only *direct* employment impacts, to test the sensitivity of the overall result on the assumption about indirect impacts. It shows that the only scheme to significantly change position when including/excluding indirect impacts is the Histon Road bus priority.

Table 4.3: Prioritisation on cumulative direct employment impact in 2031

Rank	Scheme	Employment
1	Madingley Road bus priority	2377
2	Milton Road bus priority	2334
3	A428 to M11 segregated bus route/A428 corridor Park & Ride	2041
4	A1307 Bus priority/A1307 additional Park & Ride	1589
5	City centre capacity improvements/Cross-city cycle improvements	1484
6	Saffron Walden & Haverhill pedestrian/cycle routes	1352
7	Western orbital	844
8	Chisholm Trail cycle links/Chisholm Trail bridge	785
9	Project Cambridge - Hills Road	671
10	A10 dualling and junctions/A14/A10 Milton Interchange	648
11	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	648
12	Bourn Airfield/Cambourne Busway	598
13	Hauxton Park & Ride	474
14	Hauxton-Trumpington Busway	474
15	Histon Road bus priority	435
16	Waterbeach cycle/pedestrian routes	423
17	Waterbeach new station	423
18	Airport Way Park & Ride	336
19	Bourn Airfield/Cambourne cycle routes	299
20	Cambridge to Royston cycle link	237
21	Newmarket Road bus priority	153
22	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	112
23	Foxton level crossing and interchange	0

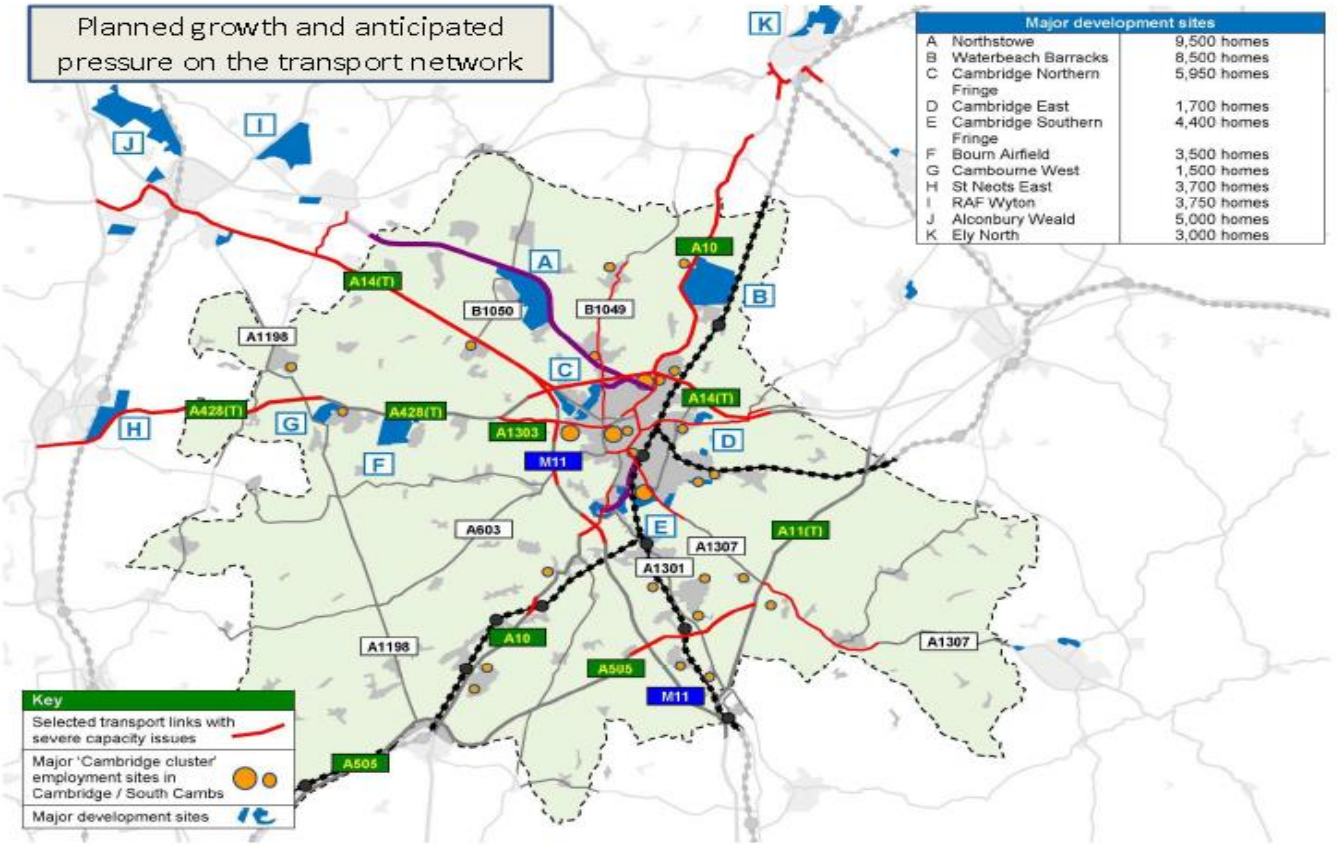
Appendices

Appendix A: City Deal Transport Schemes[6]

Programme area	Scheme	Est. cost (£m)
A428 corridor (Cambourne)	A428 to M11 segregated bus links	13.0
	A428 corridor Park & Ride	11.5
	Madingley Road bus priority	34.6
	Bourn Airfield/Cambourne busway	28.8
A1307 corridor (Haverhill)	A1307 bus priority	36.0
	Additional Park & Ride capacity – A1307	7.2
Pedestrian and cycle networks – City	Chisholm Trail links (cycle links parallel to the railway line north of Cambridge Station)	3.0
	Chisholm Trail bridge	4.5
	City centre capacity improvements	7.2
	Cross-city cycle improvements	15.5
Pedestrian and cycle networks – inter-urban	Bourn Airfield/Cambourne pedestrian/cycle route programme	8.4
	Saffron Walden and Haverhill pedestrian/cycle route programme	4.8
	Cambridge to Royston cycle link	7.2
	Waterbeach pedestrian/cycle route programme	14.4
Cambridge radials – Milton Road / Histon Road	Histon Road, Cambridge bus priority	4.3
	Milton Road, Cambridge bus priority	23.0
Cambridge radials – Hills Road	Project Cambridge, Hills Road	25.8
Cambridge radials – Newmarket Road	Newmarket Road bus priority phase 1, Elizabeth Way to Abbey Stadium	54.8
	Newmarket Road bus priority phase 2, Abbey Stadium to Airport Way	39.8
	Newmarket Road bus priority phase 3, Airport Way Park & Ride	17.3
A10 corridor south (Royston)	Foxton level crossing and interchange	21.6
	Hauxton Park & Ride	17.3
	Hauxton-Trumpington busway	15.8
Cambridge Orbital	Ring road bus priority – Addenbrooke's to Newmarket Road	18.7
	Newmarket Road to Cambridge Science Park Station busway	64.7
	Western Orbital	23.0
A10 corridor north (Waterbeach)	A10 dualling and junctions	63.4
	A14/A10 Milton Interchange	66.4
	Waterbeach Park & Ride	11.5
	Waterbeach Barracks to North Cambridge busway	46.1
	Waterbeach new station	33.1
Total		**752.7**

[6] Schemes that were suggested by an earlier EAST assessment to be most deliverable and to deliver the greatest immediate impacts are shown in blue. Source: Cambridgeshire County Council.

Appendix B: Transport corridors in and around Cambridge



Appendix C: Peer Review of TEAR and Economic Prioritisation Tool by SDG

The report on the following pages was prepared by Steer Davies Gleave as a peer review of the final draft (17/12/14) of the Transport Economic Assessment Report and Economic Prioritisation Tool.
This report (TEAR) incorporates changes to reflect SDG's comments, as appropriate.

steer davies gleave

Report

To	Mike May-Gillings (Cambridge Econometrics)
Cc	Jeremy Smith (Cambridgeshire County Council), Ben Gardiner (Cambridge Econometrics), Christine Doel (SQW), Sharon Daly (Steer Davies Gleave)
From	Steven Bishop
Date	17 December 2014
Project	Greater Cambridge City Deal – Initial Economic Prioritisation

Project No. 22758101

Peer Review – Key Logic Chains for the Impacts of City Deal Schemes

Overview

1. Steer Davies Gleave's role within this commission is outlined in the joint response submitted by Cambridge Econometrics and SQW, to *"provide a peer review function to assure our approach and results, and further the integrity of this independent assessment."*

2. Steer Davies Gleave is an expert transport planning consultancy and the project team involved in this review includes:

   - Sharon Daly BEc (Accounting), Certified Practicing Accountant (ASCPA), MAPM: Head of UK Transport Planning with almost 20 years; transport planning expertise and Independent Technical Evaluator for the Greater Cambridge Greater Peterborough Local Transport Body.
   - Steven Bishop BA Hons (Geog), MA Cantab (Geog), PRINCE II: Deputy Head of UK Transport Planning, over 10 years' transport planning expertise, and former member of the Cabinet Office's Cities Policy Unit and part of the team that led on the Greater Cambridge City Deal.

3. This report is the second stage of the peer review process. It is party of the assurance process of the analysis and prioritisation of schemes as reported and conducted in the Transport Economic Assessment Report[1] and Economic Prioritisation Tool spreadsheet[2] supplied by Cambridge Econometrics and SQW.

4. The review is in the form of a number of comments presented in tables overleaf, along with an 'RAG' assessment of the importance and urgency of the comments. A 'red' (R) assessment is for a comment which must be addressed before any further work is conducted; an 'amber' (A) assessment is for a comment which should be addressed in the next iteration of this document and for inclusion in future work; and a 'green' (G) assessment is for a comment that is for consideration only.

[1] Document: CityDeal_TEAR_171214.pdf (Received 17 December 2014)

[2] Document: City Deal_EconomicPrioritisationTool_Baseline.xls (Received 17 December 2014)

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Review of Transport Economic Assessment Report

1. Introductory Text

Document Reference	Comment	Assessment
Page 1 / Section 1.1. / Paragraph 1	Should note that the City Deal will not only help create over 33,300 new homes, but "accelerate" their delivery. It will also "enable delivery of 1,000 extra new homes on rural exception sites".	A/G
Page 1 / Section 1.2. / Paragraph 1	Where are the other additional benefits recorded for each scheme / package of schemes?	A

2. Qualitative Assessment

Document Reference	Comment	Assessment
Page 3 / Section 2.1 / Paragraph 1	The City Deal is not only important for Cambridge, but the Greater Cambridge area (and nationally important).	A/G
Page 3 / Section 2.1 / Paragraph 1	Do not agree that the "bottom line" of the City Deal is "fundamentally different", although some differences are acknowledged regarding key metrics along with the difficulty in modelling the economic impact of transport schemes. However, this does not negate the need for ex-ante appraisal using current methodologies - the Local Enterprise Partnership will likely require transport schemes to be subject to further appraisal against DfT metrics, broadly in line with HM Treasury's *The Green Book Appraisal and Evaluation in Central Government* and Guidance on Appraisal and the Department for Transport's online *Transport Analysis Guidance (webTAG)*.	A
Page 5 / Section 2.2. / Paragraph 2 and 5	Journey time savings and increased accessibility and also important along with improvements to "capacity and reliability".	A
Page 5 / Section 2.3 / Paragraph 1 (also Page 13 / Section 3.2 / Paragraph 1)	Recommend caveating the scale of impact a scheme can claim is a range, but for the sake of assessment a single value has been assigned.	A

3. Quantitative Assessment

Document Reference	Comment	Assessment
Page 11 / Section 3.2 / Paragraph 1 and Page 13 / Section 3.1 / Paragraph 1	Further rationale should be given to why the 4, 2, 1 scale has been used for 'criticality for development' when the 'scale of impact' scale is percentage based / different, especially when values from both scales are multiplied together as part of the assessment to calculate a 'causal link to development' percentage.	A
Page 13 / Section 3.3 / Paragraph 4	Does the sensitivity analysis of optimism bias provide a suitable test of the scale used for 'scale of impact'? If so, provide justification, or if not, provide reason why sensitivity testing is not required.	A
General	Consideration could be given to if the development is scalable or a 'counterfactual' level of development without the scheme (e.g. fewer houses resulting in fewer trips, resulting in planning permission being granted). Similarly, is there evidence that the scheme / package of schemes along a corridor does provide sufficient transport benefits to permit all proposed development?	A
General	Recommend that further analysis is conducted using available models of the demand-side impacts of these schemes.	G

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4. Key Findings and Appendices

Document Reference	Comment	Assessment
General	The brief did specify that consideration of deliverability was subject to another study, but within in Appendix A, the earliest start and finish date of each scheme could be listed as a reference aid.	G
General	Might relative unit cost metrics be derived meaningfully from the cost of the scheme and the scale of impacts against the three metrics?	A/G

Other Comments

Document Reference	Comment	Assessment
General	Description of the developments (scale, land use, timescales) and transport schemes would be beneficial in the report, including narrative of the logic chain and any contingencies (e.g. impact or reliance of a Growth Deal scheme).	G

Economic Prioritisation Tool

5. Several of the comments which apply to the report have ramifications for the assessment and should be considered for both the report and the assessment tool, principally, assessment of counterfactual, contingency, demand-side impacts, and evidence of scheme impact (i.e. schemes can actually accommodate the full scale of development). Additional comments are identified below.

Info Worksheet

Document Reference	Comment	Assessment
Cell E25 and Cell E29	The assumptions table would benefit from further description of the baseline / rule definitions for the scales.	A/G
Cell E37 and Cell E38	It should be noted that the assessment has not challenged the job and housing assumptions as provided in the sources referenced.	A
Cell E37 and Cell E38	Do the sources referred to also including a profiling of the ramp-up in job or housing numbers for each corridor, as shown in the Assumptions worksheet?	A/G

DirectHousing / DirectEmployment / IndirectEmployment Worksheets

Document Reference	Comment	Assessment
General	Providing explanation in the Info worksheet or in the individual worksheets of the pink shading of cells (e.g. DirectHousing J14:N14)	A/G

Other Comments

6. There is a final consideration regarding the impact of the development and transport schemes in their entirety. Whilst transport schemes might enable economic development at a corridor level, the impact on the functioning of the city centre may be so detrimental as to undermine fully the benefits claimed. How this is being considered either as part of this assessment or in parallel or future studies should be made.

Appendix D: Sensitivity Analysis

Table D.1: Total (direct and indirect) employment impact by 2031, showing sensitivity analysis on criticality

Optimism bias = 20%. Top criticality = 3		**Optimism bias = 20%. Top criticality = 4**	
Milton Road bus priority	3560	Milton Road bus priority	3741
Madingley Road bus priority	3337	Madingley Road bus priority	3439
A428 to M11 segregated bus route/A428 corridor Park & Ride	2833	A428 to M11 segregated bus route/A428 corridor Park & Ride	2935
City centre capacity improvements/Cross-city cycle improvements	2634	City centre capacity improvements/Cross-city cycle improvements	2698
A1307 Bus priority/A1307 additional Park & Ride	2534	A1307 Bus priority/A1307 additional Park & Ride	2511
Saffron Walden & Haverhill pedestrian/cycle routes	2010	Saffron Walden & Haverhill pedestrian/cycle routes	1999
Western orbital	1462	Western orbital	1439
Chisholm Trail cycle links/Chisholm Trail bridge	1351	Chisholm Trail cycle links/Chisholm Trail bridge	1379
Project Cambridge - Hills Road	1344	Project Cambridge - Hills Road	1321
Bourn Airfield/Cambourne Busway	1251	Histon Road bus priority	1256
Histon Road bus priority	1170	A10 dualling and junctions/A14/A10 Milton Interchange	1123
A10 dualling and junctions/A14/A10 Milton Interchange	1088	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	1123
Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	1088	Bourn Airfield/Cambourne Busway	1062
Waterbeach new station	918	Hauxton Park & Ride	868
Hauxton Park & Ride	879	Hauxton-Trumpington Busway	868
Hauxton-Trumpington Busway	879	Waterbeach new station	843
Airport Way Park & Ride	841	Airport Way Park & Ride	818
Waterbeach cycle/pedestrian routes	749	Waterbeach cycle/pedestrian routes	686
Bourn Airfield/Cambourne cycle routes	625	Newmarket Road bus priority	544
Newmarket Road bus priority	567	Bourn Airfield/Cambourne cycle routes	531
Cambridge to Royston cycle link	524	Cambridge to Royston cycle link	513
Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	507	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	454
Foxton level crossing and interchange	168	Foxton level crossing and interchange	157

Table D.2: Total (direct and indirect) employment impact by 2031, showing sensitivity analysis on optimism bias

Optimism bias = 30%. **Top criticality = 4**		**Optimism bias = 20%.** **Top criticality = 4**		**Optimism bias = 0%.** **Top criticality = 4**	
Milton Road bus priority	3817	Milton Road bus priority	3741	Milton Road bus priority	3589
Madingley Road bus priority	3657	Madingley Road bus priority	3439	Madingley Road bus priority	3004
A428 to M11 segregated bus route/A428 corridor Park & Ride	3070	A428 to M11 segregated bus route/A428 corridor Park & Ride	2935	City centre capacity improvements/Cross-city cycle improvements	2739
City centre capacity improvements/Cross-city cycle improvements	2677	City centre capacity improvements/Cross-city cycle improvements	2698	A428 to M11 segregated bus route/A428 corridor Park & Ride	2668
A1307 Bus priority/A1307 additional Park & Ride	2660	A1307 Bus priority/A1307 additional Park & Ride	2511	A1307 Bus priority/A1307 additional Park & Ride	2216
Saffron Walden & Haverhill pedestrian/cycle routes	2166	Saffron Walden & Haverhill pedestrian/cycle routes	1999	Histon Road bus priority	1690
Western orbital	1424	Western orbital	1439	Saffron Walden & Haverhill pedestrian/cycle routes	1666
Chisholm Trail cycle links/Chisholm Trail bridge	1362	Chisholm Trail cycle links/Chisholm Trail bridge	1379	Western orbital	1471
Project Cambridge - Hills Road	1333	Project Cambridge - Hills Road	1321	Chisholm Trail cycle links/Chisholm Trail bridge	1412
A10 dualling and junctions/A14/A10 Milton Interchange	1048	Histon Road bus priority	1256	Project Cambridge - Hills Road	1298
Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	1048	A10 dualling and junctions/A14/A10 Milton Interchange	1123	A10 dualling and junctions/A14/A10 Milton Interchange	1275
Histon Road bus priority	1039	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	1123	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	1275
Bourn Airfield/Cambourne Busway	981	Bourn Airfield/Cambourne Busway	1062	Bourn Airfield/Cambourne Busway	1225
Hauxton Park & Ride	909	Hauxton Park & Ride	868	Waterbeach new station	1050
Hauxton-Trumpington Busway	909	Hauxton-Trumpington Busway	868	Airport Way Park & Ride	963
Airport Way Park & Ride	745	Waterbeach new station	843	Hauxton Park & Ride	788
Waterbeach new station	740	Airport Way Park & Ride	818	Hauxton-Trumpington Busway	788
Waterbeach cycle/pedestrian routes	661	Waterbeach cycle/pedestrian routes	686	Newmarket Road bus priority	780
Cambridge to Royston cycle link	494	Newmarket Road bus priority	544	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	739
Bourn Airfield/Cambourne cycle routes	490	Bourn Airfield/Cambourne cycle routes	531	Waterbeach cycle/pedestrian routes	737
Newmarket Road bus priority	426	Cambridge to Royston cycle link	513	Bourn Airfield/Cambourne cycle routes	613
Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	312	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	454	Cambridge to Royston cycle link	551
Foxton level crossing and interchange	79	Foxton level crossing and interchange	157	Foxton level crossing and interchange	314

Table D.3: Total (direct and indirect) employment impact by 2031, showing sensitivity analysis on development trajectories brought forward by five years

Optimism bias = 20%. **Top criticality = 4** **Timescale of developments - as in emerging Local Plans and Annual Monitoring Reports**		**Optimism bias = 20%.** **Top criticality = 4** **Timescale of developments - brought forward five years**	
Milton Road bus priority	3308	Milton Road bus priority	4208
Madingley Road bus priority	3307	Madingley Road bus priority	4067
City centre capacity improvements/Cross-city cycle improvements	2779	City centre capacity improvements/Cross-city cycle improvements	3279
A428 to M11 segregated bus route/A428 corridor Park & Ride	2464	A428 to M11 segregated bus route/A428 corridor Park & Ride	3047
Histon Road bus priority	2023	Histon Road bus priority	2419
A1307 Bus priority/A1307 additional Park & Ride	1871	A1307 Bus priority/A1307 additional Park & Ride	2330
Western orbital	1566	Western orbital	1858
Chisholm Trail cycle links/Chisholm Trail bridge	1369	A10 dualling and junctions/A14/A10 Milton Interchange	1655
A10 dualling and junctions/A14/A10 Milton Interchange	1350	Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	1655
Waterbeach Park & Ride/Waterbeach to North Cambridge Busway	1350	Waterbeach new station	1655
Waterbeach new station	1350	Saffron Walden & Haverhill pedestrian/cycle routes	1651
Bourn Airfield/Cambourne Busway	1340	Bourn Airfield/Cambourne Busway	1637
Saffron Walden & Haverhill pedestrian/cycle routes	1307	Chisholm Trail cycle links/Chisholm Trail bridge	1598
Project Cambridge - Hills Road	1227	Project Cambridge - Hills Road	1451
Airport Way Park & Ride	1059	Airport Way Park & Ride	1247
Newmarket Road bus priority	968	Newmarket Road bus priority	1160
Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	968	Ring road bus priority Addenbrooke's to Newmarket Road/Newmarket Road to Cambridge Science Park Station busway	1131
Waterbeach cycle/pedestrian routes	749	Waterbeach cycle/pedestrian routes	957
Hauxton Park & Ride	682	Hauxton Park & Ride	836
Hauxton-Trumpington Busway	682	Hauxton-Trumpington Busway	836
Bourn Airfield/Cambourne cycle routes	669	Bourn Airfield/Cambourne cycle routes	818
Cambridge to Royston cycle link	564	Cambridge to Royston cycle link	679
Foxton level crossing and interchange	445	Foxton level crossing and interchange	521