Halcrow Group Limited
Burderop Park Swindon Wiltshire SN4 0QD
Tel +44 (0)1793 812479 Fax +44 (0)1793 812089
www.halcrow.com

Halcrow

Technical note

Project	Weston Otmoor – Transport Assessment	**Date**	22 January 2009
Note	Review of Transport Assessment	**Ref**	CT FANG 430

1 Introduction

1.1 This Technical Note identifies the key issues arising from the Central Oxfordshire Transport Model (COTM) assessment of the proposed Eco-town at Weston Otmoor. It draws upon the Parkridge Transport Assessment, December 2008, which sets out Parkridge's interpretation of the COTM output.

1.2 Also, Parsons Brinkerhoff (PB) has reviewed and reported on the work undertaken by Parkridge, on behalf of the Highways Agency.

2 Summary

2.1 The COTM model is a variable demand model. This means that it incorporates a wide range of travel choices, as opposed to the much more simple fixed trip highway models that have been previously used to assess transport schemes. Therefore, when describing the outputs from COTM, there is a need to understand the context of the outputs.

2.2 There have been two iterations of COTM runs presented in the last 6 months. These have trialled a number of inputs, and as a result of the first tranche of output, Parkridge requested changes to the input data which have been reflected in the second set of outputs. It was agreed on 19/12/08 that the inputs to the second tranche of tests, WO1-4 were in accordance with Parkridge's intentions for the proposed Eco-town. Parkridge has chosen to concentrate on test WO3 for their transport assessment, but it is noted that tests WO1, WO2 and WO4 also provide results that should be considered.

2.3 The schemes and initiatives proposed by Parkridge to provide access to/from the proposed Eco-town result, by design, in public transport being very attractive and use of the highway (car) being very unattractive. As a result of these schemes and initiatives, as a proportion of all trips leaving the proposed Eco-town, public transport accounts for 50-55% of trips

leaving the proposed Eco-town. For a morning peak hour assessment, when commuting as well as education trips dominate travel patterns, this is a high proportion and is a reflection of the inputs to the model.

2.4 In order to test the proposed Eco-town, the schemes and initiatives proposed by Parkridge have been input to the development. Parkridge acknowledge that these schemes are innovative and not generally consistent with other proposed developments being assessed for Local Development Frameworks. However, Parkridge has assured the highway authorities that the schemes and initiatives proposed are a fundable and deliverable.

2.5 It is noted that given the innovative nature of the schemes and initiatives, particular care should be undertaken in interpreting the results shown by COTM without a full understanding of the implications and risks associated with the delivery and functionality of the modelled assumptions.

Implications for policy and strategy

2.6 COTM output is much more closely aligned to actual outcomes, therefore there is a need to consider the policy implications of the output. That is, as COTM will not produce the very large queues and delays that previous models have been known to (the trips either transferring mode or deciding not to travel), there is a need to consider the outcomes produced against desired future policy for the area under consideration. For example, with the assessment of the proposed Eco-town, actual traffic volumes on the A34 are shown to be within modelled capacity of the highway (there are not significant delays).

2.7 However, this is not to say that the proposed Eco-town has not had a significant impact on the highway. It is a judgement call on whether the additional traffic generated by the proposed Eco-town means that the opportunity for other traffic to use the highway has been removed, is acceptable or not. This, in turn, depends on whether, in policy terms, the modelled use (mix of trips using the highway) is what is desired in order to fulfil the requirements of the agreed strategy. If it is considered that the strategy for the use of the highway is not met, and thus policy is not met, then the proposed development is not acceptable.

3 Model basics

3.1 The COTM is a 'variable demand model' which comprises three component parts. These are a highway model (SATURN), and public

transport model (emme/3) and a demand model (combination of emme/3 and spreadsheet). The functionality of the model is described in Annex A at the end of this technical note.

3.2 The COTM is built to fulfil the latest requirements of WebTAG, the Government's guidance procedures for assessing transport schemes. COTM's primary purpose is to assess major infrastructure projects in Oxfordshire with the aim of securing funding for these schemes. However, it is also being used for the assessment of LDF proposals and the assessment of major housing/employment sites.

4 Characteristics of COTM

4.1 The COTM is a Variable Demand Model. This means that through its internal processes it compares the cost of travel by public transport and by car in order to decide on mode choice and route choice. COTM can conclude that the cost to undertake a trip is prohibitive and thus the trips will not be made (the trip is 'suppressed'). COTM also, based on the results of the comparisons of cost of travel by public transport and car, can make changes to the destinations of trips reflecting new total journey times between origins and destinations.

4.2 The COTM assumes that all users have perfect knowledge of the public transport and highway networks. That is, each trip understands how long it will take and the fuel cost to undertake the trip by car, and how long and how much it will cost to undertake the trip by public transport. Conversely, COTM assumes that all highways operate smoothly (i.e. there are no delays due to accidents or planned/emergency road works) and that all public transport networks operate to timetable.

4.3 Considering public transport in more detail, there are factors in COTM that reflect the 'reluctance' to use public transport. These take account of the way in which, for example, potential passengers perceive waiting time and the time it takes to interchange between public transport services. These time costs, when added to the journey time and fare, provide a total cost to undertake the trip by public transport.

4.4 It should be noted that COTM primarily calculates journey costs on the basis of cost per person. From data collected for COTM, it is known that on average, in the study area, car occupancy is 1.27. That is, each vehicle has 1.27 people in it. The SATURN model assignment process uses PCUs. A car represents one PCU, a lorry 2 or 3 depending on size. Hence, there is

a need to understand where vehicle trips are being reported and when people trips are being reported.

5 Previous work undertaken

5.1 The Transport Assessment submitted by Parkridge is largely based on the results of one test, WO3, the results of which are reported in Halcrow Technical Note 6C. Previous to the four test results outlined in Technical Note 6C, Halcrow had undertaken 4 more tests. A number of issues resulting from a comparison of the two sets of results can be made.

5.2 The previous work contained tests with a £5 toll and a £50 toll. With a £5 toll, and an enhanced public transport network, there was very little mode shift. With a £50 toll there was considerable mode shift, with a 20:80 car:pt mode split being achieved. The subsequent work has indicated that a £15 toll (along with other changes) gives a significant mode split to public transport, as reported in Technical Note 6C.

5.3 The Reference Case in the previous work did not include the proposed HA scheme at M40 J9. The latest Reference Case scheme does. It is notable that this scheme does provide relief to M40 J9.

5.4 In the latest runs, the Parkridge public transport offering was made more attractive through changes to the parameters used to reflect 'reluctance to use public transport'. The second set of results showed that making these changes, which were justified by the introduction of real time information and the better knowledge of public transport that Eco-town residents would have, were shown to increase the attractiveness of public transport as an alternative to the car. This level of attractiveness of public transport is not achieved or planned to be achieved elsewhere in Oxfordshire.

6 Proposed Eco-town modelling assumptions

6.1 Parkridge has provided details on the proposed Eco-town development. The details have included trip generation data, details of transport schemes and initiatives that are proposed to be adopted to serve the proposed Eco-town and changes to assumptions used by COTM to reflect the characteristics of Eco-town residents. These have been interpreted in the COTM to replicate the travel demand and the transport schemes and services proposed in the Transportation Proposals Summary. Notably, but not exclusively, these include:

- Improvement of M40 J9.

- A single point of access to the site (including a physical constraint to 1500 PCUs and a toll set at £15 per vehicle).
- Provision of direct tram services from the site to Oxford.
- Provision of direct bus services to key towns in Oxfordshire (and beyond).
- Provision of shuttle bus services in Oxford linking a new North Oxford Exchange halt station adjacent Peatree P&R (though accessed off Linkside Avenue) to east Oxford and Oxford station to central Oxford.
- Provision of rail services serving proposed Weston Otmoor station and linking Oxford with destinations in the east of Bicester and to London.
- Improved attractiveness of public transport services to the residents of the proposed Eco-town (parameter changes).
- Provision of free public transport for the residents of the proposed Eco-town.

6.2 It was assumed that the full 15,000 dwellings and 15,000 jobs are located on the proposed Eco-town site. The COTM tests have also assumed a level of retention of trips within the proposed Eco-town. Parkridge has proposed a level of containment of 63%. The HA requested that tests also be run with a level of containment of 50%.

6.3 The Parkridge trip rate and containment calculation was based on all trips contained in the proposed Eco-town were journeys to work. Whilst this methodology is not accepted by Halcrow, comparison of the final trip generation results to those that would be expected through a TRICS based analysis, as noted above, shows that the number of trips generated by the proposed development is acceptable. It is noted that the HA has stated that it concurs with comparison and hence accepted the overall demand for travel. Specific allowance for service vehicles ('white vans') to support commercial services within the proposed Eco-town has not been made, and whilst it could be a requirement that these services vehicles arrive and depart outside peak hours, it indicates that the actual demand to access the site during the peak hour could be higher.

6.4 These network assumptions mean that the residents and employees of the proposed Eco-town have a very attractive public transport offering and, by virtue of changes to parameters, find public transport a more attractive than other trips being simulated in COTM, when compared to the equivalent LDF major site assessment testing. Also, the residents and employees of

the proposed Eco-town are subject to physical constraint and financial penalty on leaving the site. Thus, when compared to the LDF testing being undertaken by Halcrow, the assumptions being used for the proposed Eco-town discourage the use of highway (car) trips and encourage the use of public transport trips to a far greater extent.

7 Trip Generation

7.1 The Parkridge Interim Transport Assessment set out a methodology for establishing the person trip rate from the proposed development. The summary of this methodology is reproduced in Appendix 2C of the Transport Assessment. The Interim Transport Assessment compares the result from the bespoke Parkridge methodology to a more conventional TRICS analysis. The Interim Transport Assessment assesses that there is, in the AM peak hour, a demand of 5,161 people trips to leave this proposed Eco-town. This is made up of 5,007 trips from households and 154 trips from the employment.

Using a TRICS based approach

7.2 OCC Development Control identified 85th percentile trip rates for another major development (2,500 dwellings) of AM peak in 0.10 and out 0.41 and PM peak in 0.4 and out 0.20. Using these 'garden gate' rates for the proposed 15,000 house Eco-town development results in an outbound AM peak hour flow of 6,150 vehicles, which, with a car occupancy of 1.27, results in 7,811 people trips by car. If it is assumed that a further 15% of trips are undertaken by public transport, then with a 85:15 car:pt mode split this results in a total of 9,189 household garden gate people trips using a TRICS based calculation. If a 50% containment assumption is used, this means that 4,594 household garden gate people trips demand to leave the site.

7.3 If 85% of the 4,594 people from households demanding to leave the proposed Eco-town by car, then 3,905 trips by car, equates to 3,074 vehicle (car) trips leaving (taking account of car occupancy). Importantly, this calculation does not include employment trips, though employment trip numbers leaving the site in the AM peak are far less significant than the trips from households. [Note the Parkridge assessment assumes that 6,766 people demand to leave the site from households with the 50% containment assumption].

COTM results from Parkridge data

7.4 It is noted that with the proposed Eco-town infrastructure and public transport measures in place, COTM predicts that 1,652 vehicles demand to leave the site if 63% containment is assumed, and 2,312 vehicles demand to leave the site if 50% containment is assumed. These totals do not include suppressed trips, but include employment trips.

Comparing the Parkridge COTM results to the TRICS results

7.5 The COTM has been used to analyse the impact of the proposed Eco-town on the surrounding transport networks. The above comparison of a more traditional TRICS based assessment and the data provided by Parkridge and the subsequent results from the demand model shows that the resulting demand for highway (car) based trips leaving the proposed Eco-town is greater under the TRICS based assessment.

7.6 However, the COTM results presented as tests WO1-4 have a large proportion of trips being undertaken by public transport. This is a result of the public transport schemes and initiatives associated with the proposed Eco-town that have been modelled. If the same 85:15 car:pt mode split is assumed for the Parkridge household people AM peak hour trip demand, from trip to leave the proposed Eco-town (5007 trips), the calculation shows that 3,351 car trips would demand to leave with 63% containment and 4,529 trips would demand to leave with 50% containment.

7.7 The above comparison analysis indicates the importance of assumptions on mode split and containment, which is discussed further below.

8 Containment

8.1 The level of trip containment within the proposed Eco-town is critical to the number of trips both entering and leaving. Parkridge has calculated a containment proportion of 63% (as shown in their Interim TA). This results in a predicted, in the AM Peak Hour, 5161 people trips demanding to leave the site and 2748 people trips arriving. The HA has requested that runs be undertaken assuming a 50% level of containment. This results in a predicted, in the AM Peak Hour, 6966 people trips demanding to leave the site and 3710 people trips arriving.

8.2 The CLG Eco-town guidance sets a minimum containment figure for an Eco-town as 50%. It is notable that no time is identified through the day for

this target to be met, hence it could be considered to be a 24 hour target. During the peak hours the majority of commuting trips occur, and these trips tend to be longer in nature. Also, when considering containment in its broadest sense, there is a need to consider all trip modes, including cycling and walking. The CLG Eco-town guidance does not distinguish between modes, and hence the target 50% containment could be interpreted as including all modes.

8.3 Thus, containment is a complex issue. The percentages assumed in the COTM tests (63% and 50%) only apply to people trips using the highway network as car driver and passengers on public transport and they are used for AM and PM peak hour assessments when the average trip length is biased by commuting trips. The COTM analysis does not include, for example, cycle or pedestrian trips, which could be expected to bring the average trip length down. Thus, as the trips in COTM are just 'motorised' trips, the achievement of 63%, or even 50%, containment within the proposed Eco-town will be challenging.

8.4 In Halcrow Technical Note 6C, COTM results for 4 tests are shown. WO1 and W03 assume 63% containment and WO2 and WO4 show results for 50% containment.

9 Trips generated by the proposed Eco-town and mode choice

9.1 The following section considers what can happen to trips demanding to leave the proposed Eco-town and outlines the assumptions COTM uses to calculate what choices are made. It should be noted that under all tests, not all trips that demand to leave the site actually do. Trips demanding to leave the site can be subject to the following:

- Suppression – which means that the COTM calculates that there is no reasonable cost to travel available, and hence COTM predicts that trip does not travel during that modelled hour.
- Change destination – for some trips, COTM compares the choice of destinations and hence COTM can change the destination of a trip if the total journey time becomes too long and an alternative exists.
- Model split – if the cost of the trip is acceptable (either by public transport or highway (car)), COTM calculates whether the trip would be undertaken by public transport or highway (car).
- Queue – if the trip is calculated to use the highway, it may be subject to queuing at some point on its journey. Parkridge has assumed that both a physical constraint on the number of trips

entering and leaving the site will be imposed, as well as a Toll to discourage travel. The COTM predicts that trips will queue to leave the site.

9.2 It should be noted that trips leaving the proposed Eco-town site are subject to both suppression and queuing. Suppression is a 'choice of last resort', and hence COTM allows queuing in the site for trips that are predicted to undertake the journey by highway (car) but are not able to complete the journey in the modelled hour.

9.3 The capacity of the public transport network is not constrained. There is a 'crowding function' that would take effect at very high loadings (not reached in the testing of the proposed Eco-town). Thus, whilst under some tests the public transport services are shown to be over capacity, this has not impacted on their attractiveness to be used as a mode of travel.

9.4 A 'hassle factor' has been included in the COTM model. This factor replicates the additional cost incurred by highway (car trips) in incurring the Toll. That is, as with factors (derived from recognised research) that are applied to public transport measure to reflect 'reluctance to use public transport', this factor was included at the request of Parkridge to reflect the reluctance people would have to exit the site via the Toll road (the only route out of the site). A 'hassle factor' of this nature is not normally used in assessments of this nature. As this is a special requirement for these COTM Eco-town tests, with and without the 'hassle factor' tests have been modelled. Tests WO2 and WO3 have the 'hassle factor' included.

9.5 The public transport model calculates the cost of each trip from the addition of fare and time costs to undertake the journey. The total time taken to undertake the journey is split into elements such as the actual journey time, the wait time at the station or bus stop, the time taken to transfer between modes of transport, etc. These times are given different weightings according to the particular type of transport (fixed track is considered to be more attractive that bus) and the knowledge of the user. There are recognised standard weightings (factors) that are used in modelling, based on recognised research. The COTM uses these standard factors. For the proposed Eco-town, Parkridge requested that these factors be changed to reflect the better knowledge of public transport residents of the proposed Eco-town would have and reflect that residents of the proposed Eco-town would be more inclined to use public transport. In modelling terms, this change to factors for Eco-town residents makes the

public transport provided cheaper in overall journey cost terms, and hence more attractive when compared against travel by car.

9.6 It is important that changes to these factors should be noted. The COTM results are reliant on the residents of the proposed Eco-town exhibiting these characteristics, the COTM results as presented in TN6C will not be realised.

10 Site access

10.1 The proposed Eco-town has one access point. As a key element of the demand management strategy for the proposed Eco-town, the capacity of the access road has been restricted to 1500 PCUs in each direction. This means that the number of vehicles that can pass this section of highway in any one hour is constrained to 1500 PCUs. The access link is also subject to a monetary Toll which is incurred by all vehicles passing a single point.

10.2 The physical constraint has been set at 1500 PCU (passenger car units). It should be noted that this constraint does not apply to trips to/from the proposed Eco-town P&R provision. The constrained link and the link to/from the P&R are accessed directly off the proposed new M40 Junction 9. It is proposed that the new M40 J9 junction is signalised, and though this means that the capacity of links into the junction can be managed to allow desired volumes, it is reasonable to consider that the combined capacity from this single access from the proposed Eco-town and P&R is of the order of 2,000 to 2,400 PCU.

11 Free public transport

11.1 The Parkridge proposed transport network provides for free public transport for the residents of the proposed Eco-town travelling to Oxford and Bicester.

11.2 In modelling terms, the provision of free public transport requires the removal of this cost from the overall generalised cost of public transport for the relevant trips. Clearly, if free public transport was not achieved, the cost of public transport would increase, public transport would not be as attractive when compared to undertaking trips by car, and hence the COTM results would not be realised.

12 Interpretation

12.1 As has been noted, the COTM is a 'variable demand model' built to the latest WebTAG guidance for strategic transport models. This guidance is

relatively recent, and due to the cost of building such a model, not many have yet been built and used for the testing of transport schemes and development proposals. The primary function of the WebTAG guidance is to provide guidance to support the assessment of transport infrastructure projects and major scheme bid preparation.

12.2 The 'variable demand model' seeks to replicate likely actual future situations on the transport network. The methodology was developed as a result of concerns that traditional fixed trips matrix models did not replicate actual behaviour in congested network environments. In such environments, people decide to change mode, decide to travel to alternative destinations or as a last resort not travel at all. The 'variable demand model' allows all theses choices.

12.3 However, allowing these choices means that the previous way of analysing transport model output for a transport assessment of this nature is no longer valid. That is, a model of this nature is not likely to produce very large delays and queues on the highway network as would have been previously seen and reported upon with fixed trip models. That is, as with real life experience, if delays and queues, notably on the highway network become unacceptably large, people make other choices as opposed to simply 'joining the end of the queue' which has traditionally been the case with model assessments of this nature.

12.4 The highway model used in COTM is SATURN. A notable feature of this model is the production of Actual and Demand flows. The SATURN manual contains the following definition.

'We therefore define "flow" in **SATURN** in two distinct ways:

1) As the "assigned" or "demand" flow. This is the flow given by the assignment stage and corresponds to the total demand independent of when the flow arrives.

2) The "actual" or "simulated" flow which corresponds to the actual flow during the time period simulated.'

12.5 Thus, in addition to the characteristics of the variable demand model described above, there is a need to consider both the actual and demand flows when interpreting the COTM outputs. The choices the COTM makes for trips leaving the proposed Eco-town have been described above (and noted here, with an additional note of which stage of the COTM process the 'choice' is made):

- Suppression (variable demand model);
- Change destination (variable demand model);
- Modal choice (variable demand model); and
- Queue (SATURN model).

12.6 These choices are, of course, available to all trips in the model.

12.7 In the COTM model, the differences between actual and demand flows on highway links are not as large as could be shown by a fixed trip model. That is, as trips have other 'choices' (suppression, change destination, mode choice). However, when analysing the model, consideration should be given to the differences shown and attention drawn to highway links where the actual flow equates to the capacity of the link and there is a difference in flow between the actual and demand flows. This shows that if 'problems' were solved up stream from that point, more flow could demand to use the section of highway under consideration.

12.8 Finally, it should be noted that on many of the strategic highway links reported in TN6C, the Reference Case flow and the WO1-4 tests flow are similar. This shows that COTM is makes best use of the highway network, no matter what development scenario is placed. Indeed, it is noted that the reference case include all LDF growth for Oxfordshire to 2026. It could be expected that this alone, without the proposed Eco-town, would produce significant congestion on the strategic highway network, notably the A34. However, COTM predicts that the network will be busy, but not significantly over capacity. This is because, in reality, this is what would happen in the 'real world' (links shown use double capacity is a physical impossibility) and hence COTM reflects real outcomes. Accordingly, COTM models the proposed Eco-town in the same way, accommodating its growth. This is not to say that the proposed Eco-town would not have significant impacts on the highway.

13 Park and Ride

13.1 A P&R facility, utilising the proposed Eco-town station to Oxford station rail service, has been provided adjacent to the proposed Eco-town. This facility has access onto M40 J9, and is not subject to the physical or financial constraint. As a 6,000 space car park has been indicated by Parkridge, no capacity constraint was put on the car-park size.

13.2 For potential trips from north-east of Oxford to central Oxford, there are existing park and ride facilities at Water Eaton and Peartree. The assessment

of the proposed site assumed that potential users would have the choice of these two existing facilities, or the proposed new facility. It was the intention of Parkridge that the trips that would be attracted to the new P&R facility would offset the additional trips from the proposed Eco-town.

13.3 COTM has shown that this will not be the case. The model predicts that 100 vehicles would use the P&R service. Parkridge had assumed that 600 vehicles would use the new facility. However, the model has shown that there are only c.600 trips in total travelling southbound on the A34 towards Oxford with a destination within the Oxford ring road in the AM peak hour, some of which may choose to use one of the three P&R facilities on offer, but others would have private parking facilities or free parking facilities. Hence, the anticipated 'off-setting' of trips has not happened.

14 Example analysis

14.1 Interpretation of a variable demand model to establish the impact of a proposed development requires consideration of a range of outputs, and single values should not be taken out of context. For example, considering the A34 between M40 J9 and Peartree junction, Table 17 of Halcrow Technical Note 6c shows actual and demand traffic flows, and actual traffic count data at some locations. However, these COTM results need to be seen, with respect to the assessment of the proposed Eco-town, in the context of the following results also presented. Results quoted below are from WO2 (with elasticities used to simulate the additional delay leaving the proposed Eco-town and 50% containment) and WO3 (with highway 'hassle factor' exiting the proposed Eco-town and 63% containment). It is noted that Parkridge has chosen to use WO3 as a basis for their Transport Assessment.

14.2 Tables 4 and 5 show the modal split of trips leaving the proposed Eco-town. This data was further broken down in the supplementary information supplied in the table entitled Mode Split, Suppression and Queue Proportions. This table shows that for most tests 7% of all trips are suppressed. This means that for test WO2 337 people trips out of 5161 choose not to travel, and for test WO3 457 people trips choose not to travel out of 6966.

14.3 Of the trips that COTM predicts will commence their journey, the choice of public transport or highway has to be made. COTM makes this choice by comparing generalised costs for each mode. COTM takes account, in the generalised cost calculation, of the constraints (the exit of the proposed

Eco-town does not allow more than 1,500 PCU to leave in any one hour) and Tolls on the highway network, and frequent, free, and high 'user knowledge and willingness' on the public transport network. These factors have all contributed towards the 50% to 55% public transport modal share.

14.4 For the trips assigned to the highway, Table 10 shows the difference between actual and demand PCU flows. If this is converted to people trips, COTM shows that under test WO2 1030 people trips are queued (811 PCUs) and under test WO3 192 people trips are queued (152 PCUs).

14.5 Thus, if the suppressed trips and queued on site trips are added, COTM predicts, with the demand management measures in place on the exit of the proposed Eco-town in the AM peak hour, that under test WO2 1487 people trips out of 6966 do not leave the site and under test WO3 529 people trips out of 5161 do not leave the site.

14.6 Under a fixed trip assignment process there would not be any suppressed trips. Also, and importantly, the modal split that has been achieved and the assumptions necessary to achieve this should be noted. The queues predicted would remain, as queues are calculated in the SATURN model as opposed to the variable demand model. However, queued traffic is reflected in the difference between actual and demand PCU flows.

14.7 Thus, when considering the results presented in Table 17, the considerations noted above need to be taken into account. That is, taking the section between M40 and B430, the actual flow is shown as 3384 for the WO2 test and 3463 for the WO3 test. The following needs to be considered:

- The actual flow is the flow that has reached that point on the network.
- The demand flow (also shown on Table 17) is the flow that would arrive at that point, if it was not queued elsewhere in the network. That is, for example, some vehicles are queued on the proposed Eco-town site. If these were released, they would arrive at this point and hence should be taken into consideration. The table shows that the demand flow is shown as 4151 for the WO2 test and 3704 for the WO3 test . The difference in flow between the actual and demand at this location on the A34 is a function of all trips on the network, and hence consideration of the reference case and the WO tests should be made.

- The demand model has assessed the proportion of trips undertaken by public transport and by highway (car). This function of the model considers the generalised costs of each trip and it compares the costs of undertaking the trip by public transport against the highway (car). Thus, consideration should be given to the relative attractiveness of each mode when considering actual and demand flows on the highway.
- The demand model has assessed that some trips will be suppressed. These trips have not travelled due to the cost calculations, but there was a demand to make these trips. Hence, they should be considered in the assessment of the impact of the proposed development as suppressed trips indicate a significant cost to undertake a trip which in turn means significant congestion or lack of opportunity to undertake the trip by public transport.

14.8 The above considerations should be considered when reviewing all links on the highway model. That is, whilst COTM shows that links are within capacity, there are other equally important aspects of the COTM functionality and output that give the results reported in Technical Note 6c. Not to take these into consideration is to ignore important aspects of the modelling work undertaken.

15 Specific comments on TA

15.1 This section of this Technical Note specifically considers some of the comments/conclusions drawn by Parkridge in the Transport Assessment.

15.2 Section 2.1.2 – Parkridge note that "the key parameters and assumptions used as input to COTM have been agreed with the Highway, Planning and Transport Authorities". This wording could suggest that the authorities accept the input parameters and assumptions as being appropriate for assessment of a proposed development of this nature, which is something that the authorities may disagree with. It is incorrect for Parkridge to conclude that by accepting the key parameters and assumptions for input to COTM that they accept them as being correct for the purpose of the assessment of the proposed development at this location. Indeed different parameters and assumptions are being used for the assessment of the alternative Eco-town provision to the north of Bicester.

15.3 Section 2.2.2 – Parkridge discuss containment and delay functions. Parkridge note that they have looked at the 2001 census data for Oxford and established that Oxford exhibits 60% containment. It is noted that the

data used here is journey to work data and is effectively a 24hr figure. COTM uses all trip purposes and is a modelled peak hour based on data collected during the peak hour. COTM outputs and data derived from journey to work data should not be directly compared and results from journey to work analysis should not be used to justify COTM inputs or outputs.

15.4 Section 2.3.5 – Parkridge note that there is a 1,500 vehicle physical constraint, but that gantry control would reduce existing traffic to 1,000 vehicles per hour. Tests WO1-4 have assumed a 1,500 PCU physical constraint. It should be noted that the traffic that is unable to leave the proposed Eco-town during the modelled hour would expect to leave in the next hour. Assuming that all suppressed trips would like to leave by car (not unreasonable given the attractiveness and no capacity constraint on the public transport network), the residue demand to leave the proposed development area under test WO3 is 488, and under test WO2 is 1172. As the physical constraint is set at 1,500 PCU, under test WO2, only 328 'additional vehicles' could leave the proposed Eco-town in the next hour. No reference has been made to this issue in the Transport Assessment.

15.5 Section 2.4.2 – Parkridge note the model split of trips for highway and public transport leaving the proposed Eco-town. Whilst this data is correct, a more complete presentation of results for test WO3 would be:

- AM Peak Hour (from proposed Eco-town)
  - Suppressed trips 7%
  - Highway trips (queued) 4%
  - Highway (exiting) 37%
  - Public Transport 53%

- PM Peak Hour (from proposed Eco-town)
  - Suppressed trips 7%
  - Highway trips (queued) 3%
  - Highway (exiting) 35%
  - Public Transport 53%

15.6 A more complete presentation of results for test WO2 would be:

- AM Peak Hour (from proposed Eco-town)
  - Suppressed trips 7%
  - Highway trips (queued) 15%

- Highway (exiting) 27%
- Public Transport 51%

- PM Peak Hour (from proposed Eco-town)
  - Suppressed trips 7%
  - Highway trips (queued) 4%
  - Highway (exiting) 34%
  - Public Transport 55%

15.7 It is important to record the suppressed trips and the queued trips, especially as there has been no attempt to accommodate the demand for highway (car) trips as this goes against the stated demand management strategy.

15.8 Section 2.5.3 – the characteristics of COTM have been described in this technical note. As a result of the variable demand functions, COTM will not produce major delays on the highway network. This can be seen by comparison the Reference Case flows and tests WO1-4, which show that, on strategic routes, the Reference Case flows are not dissimilar to the WO tests. Hence, it should be expected that the impact on the surrounding network is minimal, and this should be taken as meaning that the proposed Eco-town or indeed any other major development will not have a significant impact on journey patterns on the highway network.

15.9 Parkridge note that "there will be no additional impact on the A34 and M40J10. In terms of M40J10, COTM predicts that relatively low proportions of traffic from the proposed Eco-town, and hence, though there would be impact (displaced trips), it would not be significant. However, for A34, whilst COTM does not predict significant queues and delays as a result of introducing additional trips to the proposed Eco-town, it should be noted that this result is a function of the proposed Eco-town measures in combination with the choices available to trips (mode choice, trip suppression and trips destination choice). It is also noted that 'impact' should be defined. If queues and delays equate to impact, then the impact is limited. If impact is defined in a more strategic way, that is use of the highway for different purposes (e.g. strategic verses local tips) or by different trip movements (e.g. proposed Eco-town trips as opposed to trips from Bicester), the impact is significant.

ANNEX A

A Model basics

A.1 The base year for the local model is 2007. Matrices and networks have been developed for a 12-hour day representing 0700-1900 and these are further subdivided by time period. Assignments within the highway model (using SATURN) and public transport model (using Emme/3) are obtained for the following time periods:

- Morning peak hour between 0800-0900;
- Average Interpeak hour between 1000 and 1600; and
- Evening peak hour between 1700-1800.

A.2 The COTM simulates a single hour of trip movement. As COTM covers a large area, with significant rural areas, it does not assume any queues at the start of the modelled time period.

Trip Purposes

A.3 Trip matrices have been developed for a range of travel purposes:

- Home based work;
- Home based employers business;
- Home based education;
- Home based shopping;
- Home based other;
- Non-home based employers business; and
- Non-home based other.

A.4 Matrices have been produced for private vehicle and public transport users separately. A further segmentation has been developed to represent car available and non-car available public transport users. For the highway assignments, matrices have also been developed of light vans and other goods vehicles.

Sources of Trip Matrix Data

A.5 The highway matrices are based on a combination of observed and synthetic elements. The observed elements are based on Roadside Interview Surveys undertaken during 2007 in Central Oxfordshire, supplemented by data collected in Didcot and Wantage in 2005, Witney in 2005 as well as the

LATS data for the M40 slip roads in 2001. Time period and purpose matrices have been developed for movements across a series of COTM screenlines. Intra-sector movements have been developed using gravity models for each purpose.

A.6 The rail matrices have been derived from a combination of Network Rail, Department for Transport (DfT) and new survey data at stations in Oxfordshire.

A.7 The local bus matrices have been developed from census journey to work data and surveys undertaken in Oxford and surrounding towns. The bus and rail matrices are combined to produce a public transport matrix.

The Forecasting Methodology

A.8 The COTM has been developed to take account of the following influences in travel:

- Changes in the numbers generated ;
- Changes in the distribution of trips;
- Changes in the choice of mode for trips;
- Changes in the time of travel of trips; and
- Changes in the choice of route for trips.

A.9 For the most part, COTM operates incrementally on base demands in proportion to changes in land use and economic quantities, and transport generalised costs. The exception is the introduction of a new mode or service, such as a new park and ride site in which case an absolute model is used.

A.10 Thus COTM comprises a number of stages including:

- Stage 1: Trip End Forecasting;
- Stage 2: Initial Assignment;
- Stage 3: Demand Model
- Stage 4: Re-Assignment (over a number of loops)

A.11 The calculations in the demand model are driven by changes in Generalised Costs (GCs).

A.12 Public Transport GCs are calculated for each purpose, differing only in respect of the value of time. They are derived as follows:

$$C_{ij}^{(pt.p)} = f.D_{ij}/v^{(pt)} + I_{ij} + w.W_{ij} + x.X_{ij} + a.A_{ij}$$

Where:
$C_{ij}^{(pt.p)}$ = generalised cost by public transport between i and j for purpose segment (p);
f = fare per kilometre in pence;
D = travel distance in km;
$v^{(pt)}$ = value of time for segment p in pence per minute;
I = in-vehicle time in min;
w = wait time weight;
W = wait time in min;
x = transfer penalty in min;
X = number of transfers;
a = access and egress time weight; and
A = access and egress time in min.

A.13 Private vehicle GCs are calculated for each purpose, again differing only in respect of the value of time:

$$Cij(car.p) = Iij + (f.c.Dij + Pj + Rij)/v(p)$$

Where:
Cij(car.p) = generalised cost by car between i and j, for segment p;
I = in-vehicle time in min;
f = fuel cost in pence per litre;
c = fuel consumption in litres per kilometre;
D = highway distance in km;
P = parking charge in pence;
R = road user charges in pence; and
v(p) = value of time for segment p in pence per minute.

A.14 The parameters for calculation of generalised costs are sourced from Transport Analysis Guidance (TAG) Unit 3.5.6.

A.15 The base year values of time are as follows:

- Car Business = 48.9 p per min
- Car Commuting = 11.0 p per min
- Car Other = 9.7 p per min

- Public transport = 56.4 p per min

A.16 The values for 2026 are increased in line with the guidance in TAG Unit 3.5.6.

A.17 The weights applied for walking, waiting are as follows:

- Walk = 2.0
- Wait = 2.0

A.18 The travel times are taken from the assignments. The 'in vehicle times' are taken from input timetable files specified for each public transport service.

A.19 The changes in generalised cost that drive the calculations in the mode choice model are calculated as follows:

$$\Delta C_{ij}^{m(p)} = (C_{ij}^{m(p)'} - C_{ij}^{m(p)})$$

- Where:
  - $\Delta C_{ij}^{m(p)}$ = change in generalised cost for mode m for segment p;
  - $C_{ij}^{m(p)'}$ = test cost for mode m for segment p; and
  - $C_{ij}^{m(p)}$ = base cost for mode m for segment p.