

TECHNICAL NOTE 2a:

Trip Rates and Traffic Generations: Exemplar Site

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1 Introduction

Following a meeting that took place on 6th September 2010 with representatives of Oxfordshire County Council (OCC), Cherwell District Council, Halcrow and Hyder Consulting, it was agreed that Hyder would prepare a Technical Note setting out the proposed development trip rates for the NW Bicester site.

A previous version of this Technical Note was issued on 6th October 2010, which has now been superseded by this revised note to reflect alterations to the proposed development schedule for the Exemplar Site. It is therefore considered appropriate to circulate this note once more to reflect the revised and final traffic generations for the proposed Exemplar Site development. It is important to note that the applied trip rates have not changed from those included within the previous version of the Technical Note dated 6th October 2010.

For clarity, this note deals with the Exemplar Site and Technical Note 2b will address the Masterplan Site.

This note therefore sets out the methodology for total person and vehicular trip rates and also addresses the relationship between the trip rates and modal share targets for the proposed development.

Trip rates have been examined separately for each of the main land use categories anticipated to form part of the exemplar. Trip rates are given for the AM and PM peak hours (8-9am and 5-6pm) and in total for the 12 hour (7am-7pm) period.

At the end of the technical note, the anticipated vehicle and non vehicular generation for the Exemplar Site is summarised, based on the trip rates set out in the note. Issues of reduction for containment are also discussed.

2 Proposed Land Uses

Table 1 below provides a schedule of the proposed Exemplar Site land uses. These may be subject to later amendment but are considered to be robust (i.e. worst case) numbers of dwellings and floorspace.

Table 1: Exemplar Site Development Schedule (Full and Outline Application)

Land Use	Floorspace / Units
Residential - Total	393 units
	69.2% Market housing = 270 units
	30.8% Affordable housing = 123 units

Land Use	Floorspace / Units
Primary School	1 form entry with nursery, assume 135 pupils
Retail	Co-operative local store 550m2 Post Office 150m2 Pharmacy 110m2 Hairdressers 110m2
Community Facilities	Eco Pub 190m2 Community hall 580m2 Children's nursery 40 spaces/350m2 Allotments
Eco Business Centre	1,800m2 B1 floorspace
B1 Offices	1,100m2 B1 floorspace
Energy Centre	400m2

This Technical Note addresses the trip rates associated with the land uses as given above. Trip rates are not assessed for the green infrastructure or woodland cemetery provision.

3 Total Person Trip Rates

The following sections provide a summary of total person trip rates for each of the proposed land uses at the Exemplar Site. These total person trip rates have been obtained from the TRICS database. The TRICS (multi-modal survey) sites that have been used to generate total person trip rates were selected based on their similarity to the development proposals at the Exemplar Site.

3.1 Market and Affordable Housing

The TRICS residential sites used in the assessment are detailed in **Table 2** and **Table 3**. The number of dwellings in the selected sites is relatively low given a lack of information for larger sites.

The initial total person trip rates are shown in the tables. It can be seen that overall each private household is estimated to make **4.41** outbound and **4.11** inbound trips in a 12 hour period (**8.51** in total, two-way). This can be compared to the 2007 Travel Diary Survey which recorded each household making an average of **9.78** trip stages over the day, of which a proportion are between other off site origins and destinations. The total trips derived from TRICS are thus considered to robustly reflect the Bicester situation.

Table 2: Private Residential Dwellings Total Person Trip Rates (per dwelling)

	Arrivals	Departures	Total
AM Peak Hour	0.236	0.862	1.098
PM Peak Hour	0.616	0.377	0.993
12 hour	4.105	4.407	8.512

Table 3: Affordable Residential Dwellings Total Person Trip Rates (per dwelling)

	Arrivals	Departures	Total
AM Peak Hour	0.189	0.690	0.878
PM Peak Hour	0.493	0.302	0.794
12 hour	3.284	3.526	6.810

3.2 Education – Primary School

The education trip rates have been derived from TRICS data for primary schools. **Table 4** summarises total person trips to/from primary schools as derived from TRICS. The TRICS

dataset indicates that 42% and 78% of total person trips are by vehicle modes in the morning and evening peak hours respectively.

Table 4: Primary School Total Person Trip Rates (per pupil)

	Arrivals	Departures	Total
AM Peak Hour	1.275	0.257	1.532
PM Peak Hour	0.026	0.052	0.078
12 hour	2.344	2.289	4.633

3.3 Retail – Local Shops

The total person trip rates for retail have been taken from TRICS for local shopping areas. **Table 5** shows total person trip rates per 100m2 of gross retail floorspace.

Table 5: Retail (Local Shopping) Total Person Trip Rates (per 100sqm)

	Arrivals	Departures	Total
AM Peak Hour	14.642	13.487	28.129
PM Peak Hour	9.030	9.538	18.568
12 hour	133.697	136.844	270.541

3.4 Eco Pub Trip Rates

Total person trip rates for the proposed Eco Pub have been obtained from the TRICS database, and **Table 6** shows trip rates per 100m2 of gross retail floorspace. These trip rates do not take account of the likely increased containment of trips within the site i.e. those people who live within the Eco Town and who will represent a large proportion of customers.

Table 6: Eco Pub Total Person Trip Rates (per 100sqm)

	Arrivals	Departures	Total
AM Peak Hour	0.000	0.000	0.000
PM Peak Hour	10.835	7.017	17.852
12 hour	97.430	97.570	195.000

3.5 Community Hall

Total person trip rates for the proposed community hall have been extracted from the TRICS database, and are shown in **Table 7** below.

Table 7: Community Hall Total Person Trip Rates (per 100sqm)

	Arrivals	Departures	Total
AM Peak Hour	1.068	0.519	1.587
PM Peak Hour	1.802	0.950	2.752
12 hour	23.150	23.985	47.135

3.6 Education – Children’s Nursery

Total person trip rates have been derived from TRICS for a children’s day care nursery per 100sqm and are shown in **Table 8** below. Whilst it is likely that the modal share by car will be high for dropping off children, many vehicle trips will be linked to journeys to work.

Table 8: Children's Nursery Total Person Trip Rates (per 100sqm)

	Arrivals	Departures	Total
AM Peak Hour	5.109	2.282	7.391
PM Peak Hour	1.737	5.007	6.744
12 hour	18.528	18.698	37.226

3.7 Employment – Office

Total person trip rates for office uses have been derived from TRICS for office sites, and these have been summarised in **Table 9** below.

Table 9: Office Total Person Trip Rates (per 100sqm)

	Arrivals	Departures	Total
AM Peak Hour	4.080	0.322	4.402
PM Peak Hour	0.379	3.370	3.749
12 hour	17.966	17.173	35.139

It is worth noting that the trip rates presented in **Table 9** do not take account of containment of trips within the site i.e. those people who live within the Eco Town as well as work there.

3.8 Exemplar Site – Total Person Trip Rate Summary

Table 10 summarises the total person trip rates for the proposed Exemplar Site land uses based on the trip rates presented in **Table 2** to **Table 9**.

Table 10: Summary of Total Person Trip Rates – Exemplar Site

Land Use(s)	Morn Peak (8-9am)			Evening Peak (5-6pm)		
	Arr	Dep	Tot	Arr	Dep	Tot
Residential - Private	0.236	0.862	1.098	0.616	0.377	0.993
*Residential - Affordable	0.189	0.690	0.878	0.493	0.302	0.794
Primary School	1.275	0.257	1.532	0.026	0.052	0.078
Local Shops	14.642	13.487	28.129	9.030	9.538	18.568
Eco Pub	0.000	0.000	0.000	10.835	7.017	17.852
Community Hall	1.068	0.519	1.587	1.802	0.950	2.752
Children's Nursery	5.109	2.282	7.391	1.737	5.007	6.744
Eco Business Centre	4.080	0.322	4.402	0.379	3.370	3.749
Factor of 0.80 applied to account for affordable housing generating 20% fewer trips than private housing						

4 Mode Share

Detailed in **Table 11** is a summary of mode share for each of the proposed land uses at the Exemplar Site by vehicular and non-vehicular travel modes. These mode shares have primarily been derived from the multi-modal information that has been obtained from the TRICS database. With regards to modal share of household trips (i.e. the generation from residential uses) the modal share from the 2007 Bicester Travel Diary Mode Share for all daily trips has been used, as detailed in **Table 12**.

Table 11: TRICS/ 2007 Travel Diary derived mode share for the Exemplar Site

Land Use(s)	Morn Peak (8-9am)			Evening Peak (5-6pm)		
	Veh	Non-V	Tot	Veh	Non-V	Tot
Residential - Private	67.5%	32.5%	100%	67.5%	32.5%	100%
Residential - Affordable	67.5%	32.5%	100%	67.5%	32.5%	100%
Primary School	42%	58%	100%	78%	22%	100%
Local Shops	42%	58%	100%	57%	43%	100%
Eco Pub	0%	0%	0%	88%	12%	100%
Community Hall	50%	50%	100%	65%	35%	100%
Children's Nursery	81%	19%	100%	71%	29%	100%
Eco Business Centre	74%	26%	100%	77%	23%	100%

Table 12: 2007 Bicester Travel Diary Mode Share - All Daily Trip Purposes

Method of Travel	%age	%age	Mode
Car driver	47.4%	64.4%	Car
Car passenger	17.0%		
Light goods van	2.9%	3.1%	Goods vehicles
Heavy goods vehicle	0.2%		
Bus passenger	3.5%	32.5%	Non vehicular modes
Train passenger	0.5%		
Motorcycle	0.4%		
Bicycle	3.4%		
Walk	23.3%		
Taxi	0.5%		
Coach passenger	0.2%		
School bus	0.7%		
Community transport	0.0%		
Total	100%	100%	

It has been calculated that the proposed mix and scale of development at the Exemplar Site would result in **61%** of all trips being undertaken by vehicle modes, with **39%** utilising non-vehicular modes (based on the mode share data extrapolated from TRICS and the 2007 Bicester Travel Diary Survey).

The guidance in the annex to PPS1 sets out the aim of achieving at least 50% of trips arising from the development (i.e. from resident households) by non car modes. It is recognised that prior to the development of the masterplan site (i.e. the 5,000 homes (3,000 by 2026) and related land uses), it will be more challenging to achieve the 50:50 target modal share. The development of the adjacent parts of the overall site will lead to a step change in bus services (from 30 minute to 15 minute frequencies) and considerably enhanced provision for walking and cycling. A target modal share for 2016 (i.e. the short term post development of the exemplar site) is therefore proposed as **55%** vehicle modes and **45%** non vehicle modes. This would achieve a higher non vehicular modal share or trips than Bicester at present, with a **50%** non vehicular modal share being the target for 2026.

Detailed in **Table 13** is a summary of the vehicular and non-vehicular mode share targets in 2016 for the Exemplar Site by each land use, which given the current development mix would give a 55:45 modal share. **Table 14** shows the target modal share by land use in 2026 to give a

50:50 modal share. These target mode shares are considered to appropriately reflect the future level of accessibility at the site in the two assessment years.

Table 13: Summary of Mode Share Targets – Exemplar Site, 2016

Land Use(s)	Morn Peak (8-9am)			Evening Peak (5-6pm)		
	Veh	Non-V	Tot	Veh	Non-V	Tot
Residential - Private	60%	40%	100%	60%	40%	100%
Residential - Affordable	60%	40%	100%	60%	40%	100%
Primary School	30%	70%	100%	30%	70%	100%
Local Shops	50%	50%	100%	50%	50%	100%
Eco Pub	0%	0%	0%	45%	55%	100%
Community Hall	50%	50%	100%	50%	50%	100%
Children's Nursery	70%	30%	100%	70%	30%	100%
Eco Business Centre	70%	30%	100%	70%	30%	100%

Table 14: Summary of Mode Share Targets – Exemplar Site, 2026

Land Use(s)	Morn Peak (8-9am)			Evening Peak (5-6pm)		
	Veh	Non-V	Tot	Veh	Non-V	Tot
Residential - Private	55%	45%	100%	55%	45%	100%
Residential - Affordable	55%	45%	100%	55%	45%	100%
Primary School	30%	70%	100%	30%	70%	100%
Local Shops	40%	60%	100%	40%	60%	100%
Eco Pub	0%	0%	0%	45%	55%	100%
Community Hall	40%	60%	100%	40%	60%	100%
Children's Nursery	70%	30%	100%	70%	30%	100%
Eco Business Centre	65%	35%	100%	65%	35%	100%

5 Person Trip Generation

Using the modal share targets in 2016 and 2026, the peak hour generation of vehicular and non vehicular trips has been calculated and are summarised in [Table 15](#). It should be noted that vehicular trips relates to person trips in vehicles, rather than actual vehicle numbers (i.e. traffic generation). They also include both internal and external trips to the development site.

Table 15: Exemplar Site Vehicular and Non Vehicular Trip Generation

Year	Morning peak hour (8-9am)						Evening peak hour (5-6pm)					
	Arrivals			Departures			Arrivals			Departures		
	Veh	Non-V	Tot	Veh	Non-V	Tot	Veh	Non-V	Tot	Veh	Non-V	Tot
2016	268	266	534	270	215	485	201	154	355	211	144	355
2026	244	290	534	241	244	485	180	175	355	190	164	355

6 Non-Vehicle Modes

The total person trips generated by the exemplar land uses by non-vehicle modes are shown in **Table 16** for 2016 and 2026. **Table 16** shows the existing modal share in Bicester from the 2007 Travel Diary Surveys for comparison and puts forward an indicative target modal share for each non vehicle mode, as a proportion of total trips in 2016 and 2026. The growth in train passengers is an indicative figure assuming the implementation of the Evergreen 3 Chiltern Railways proposal.

Table 16: Non Vehicle Modes Share 2016 and 2026

	2007 Bicester		2016 Exemplar		2026 Exemplar	
Car driver	47.40%	Vehicle 67.5%	34.90%	Vehicle 55%	29.90%	Vehicle 50%
Car passenger	17.00%		17.00%		17.00%	
Light goods van	2.90%		2.90%		2.90%	
Heavy goods vehicle	0.20%		0.20%		0.20%	
Bus passenger	3.50%	Non Vehicle 32.5%	5.50%	Non Vehicle 45%	7.50%	Non Vehicle 50%
Train passenger	0.50%		3.00%		3.00%	
Motorcycle	0.40%		0.60%		0.60%	
Bicycle	3.40%		6.00%		7.00%	
Walk	23.30%		28.00%		30.00%	
Taxi	0.50%		0.50%		0.50%	
Coach passenger	0.20%		0.20%		0.20%	
School bus	0.70%		0.70%		0.70%	
Community transport	0.00%		0.50%		0.50%	
Total	100%	100%	100.00%	100%	100%	100%

Using the percentages of person trips given in the above table, the forecast numbers of bus passengers in the AM and PM peak hours in 2016 and 2026 are shown in **Table 17**.

Table 17: Exemplar Site Forecast Bus Patronage 2016 and 2026

Bus Patronage	2016	2026
AM arrival	15	22
AM depart	12	18
AM total	27	40
PM arrival	8	13
PM depart	8	12
PM total	16	25

7 Traffic Generation

7.1 Vehicle Occupancies

It is important to note that the trip rates included within the preceding sections relate to total people, meaning that it is necessary to calculate and apply appropriate vehicle occupancy rates in order to forecast the level of development traffic that could be generated by the Exemplar Site (relevant to each of the proposed land uses). Detailed in **Table 18** is a summary of vehicle occupancies by trip purpose, which have been sourced from the 2007 Bicester Travel Diary Survey.

Table 18: Vehicle Occupancies by Trip Purpose

Land Use(s)	Morn Peak (8-9am)			Evening Peak (5-6pm)		
	Arr	Dep	Tot	Arr	Dep	Tot
Residential - Privately Owned	1.5	1.5	1.5	1.5	1.5	1.5
Residential - Affordable Housing	1.5	1.5	1.5	1.5	1.5	1.5
Primary School	2.2	2.2	2.2	2.2	2.2	2.2
Local Shops	1.5	1.5	1.5	1.5	1.5	1.5
Eco Pub	1.6	1.6	1.6	1.6	1.6	1.6
Community Hall	1.6	1.6	1.6	1.6	1.6	1.6
Children's Nursery	2.2	2.2	2.2	2.2	2.2	2.2
Eco Business Centre/B1 Office	1.1	1.1	1.1	1.1	1.1	1.1

Detailed in **Table 19** and **Table 20** is a summary of the development traffic generations associated with the Exemplar Site in 2016 and 2026, based on the application of the vehicle occupancies to person trips by vehicle by each land use.

Table 19: Exemplar Site Traffic Generation (Internal and External) 2016

Land Use(s)	Calculation Factor				Units / pupils / sq.m	Morning peak hour (8-9am)		Evening peak hour (5-6pm)	
						Arr	Dep	Arr	Dep
Residential - Private	Per	no of	units	270		25	92	66	38
Residential - Affordable	Per	no of	units	123		9	33	24	14
Primary School	Per	no of	pupils	135		23	5	0	1
Local Shops	Per	100	sq.m	920		44	41	27	29
Eco Pub	Per	100	sq.m	190		0	0	6	4
Community Hall	Per	100	sq.m	580		2	1	3	2
Children's Nursery	Per	100	sq.m	350		6	3	2	5
Eco Business Centre + B1 Office	Per	100	sq.m	2,900		74	6	7	61

Land Use(s)	Calculation Factor			Units / pupils / sq.m	Morning peak hour (8-9am)		Evening peak hour (5- 6pm)	
					Arr	Dep	Arr	Dep
Total					184	180	136	154

Table 20: Exemplar Site Traffic Generation (Internal and External) 2026

Land Use(s)	Calculation Factor			Units / pupils / sq.m	Morning peak hour (8-9am)		Evening peak hour (5- 6pm)	
					Arr	Dep	Arr	Dep
Residential - Private	Per	no of	units	270	23	84	60	35
Residential - Affordable	Per	no of	units	123	8	31	22	13
Primary School	Per	no of	pupils	135	23	5	0	1
Local Shops	Per	100	sq.m	920	36	33	22	23
Eco Pub	Per	100	sq.m	190	0	0	5	3
Community Hall	Per	100	sq.m	580	2	1	3	1
Children's Nursery	Per	100	sq.m	350	6	3	2	5
Eco Business Centre + B1 Office	Per	100	sq.m	2,900	69	5	6	57
Total					166	161	122	139

7.2 Containment of Trips

It is recognised that the Exemplar Site, as the first phase of the Eco Town, will not include a full range of employment to 'contain' vehicle trips within the site, in comparison to the full Masterplan. Nevertheless, alongside the residential development will be a primary school, children's nursery, foodstore, pharmacy, public house, community centre/ multi faith centre, allotments, public open space and an eco business centre. Many of the day to day needs of residents will thus be met within the site. Whilst people will still 'travel' to them, these trips will predominately be on foot or cycle and will not take place on the external road network.

The level of likely containment of household vehicle trips has been estimated for each journey purpose and proportioned for total trips made per household in a day, as shown in **Table 21**. The overall containment level for the Exemplar Site is estimated as **17.4%**.

Table 21: Estimated Containment of Trips within Exemplar Site

Trip Purpose from Household	Proportion of Total Trips (2007 Bicester Travel Diary Survey)	Level of Containment (Estimated)
Place of work	0.28	5%
On employers business	0.09	0%
Educational attendance	0.17	30%
Shopping	0.18	30%
Other services	0.08	30%
Visiting friends/ relatives	0.09	10%
Recreation/ leisure	0.11	20%
Total	1.00	17.4%

7.3 External Traffic Generations

Using the estimated total level of containment for the Exemplar Site (**17.4%**) as a reduction on total traffic movements would result in the traffic generations on the external road network as presented in **Table 22 and Table 23** for 2016 and 2016 respectively. The traffic generations have been derived by applying the reduction factor of **17.4** (to reflect containment) to the development traffic generations presented in **Table 19 and Table 20** respectively.

Table 22: Forecast Development Traffic Generations, 2016

Land Use(s)	Morn Peak (8-9am)			Evening Peak (5-6pm)		
	Arr	Dep	Tot	Arr	Dep	Tot
Residential - Private	21	76	97	54	31	85
Residential - Affordable	8	28	36	20	11	31
Primary School	19	4	23	0	1	1
Local Shops	37	34	71	23	24	57
Eco Pub	0	0	0	5	3	8
Community Hall	2	1	3	3	1	4
Children's Nursery	5	2	7	2	5	7
Eco Business Centre + B1 Office	61	5	66	6	50	56
Total	153	150	303	113	126	239

Table 23: Forecast Development Traffic Generations, 2026

Land Use(s)	Morn Peak (8-9am)			Evening Peak (5-6pm)		
	Arr	Dep	Tot	Arr	Dep	Tot
Residential - Private	19	69	88	50	29	79
Residential - Affordable	7	25	32	18	10	28
Primary School	19	4	23	0	1	1
Local Shops	29	27	56	18	19	37
Eco Pub	0	0	0	5	3	8
Community Hall	1	1	2	2	1	3
Children's Nursery	5	2	7	2	5	7
Eco Business Centre + B1 Office	57	4	61	5	47	52
Total	137	132	269	100	115	215