Rochford District Council
Southend-on-Sea Borough Council

London Southend Airport & Environs Joint Area Action Plan

Transport Assessment

September 2008

Halcrow Group Limited

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Endeavour House Forder Way Cygnet Park Hampton
Peterborough Cambridgeshire PE7 8GX England
Tel +44 (0) 1733 560033 Fax +44 (0)1733 427988
www.halcrow.com

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Endeavour House Forder Way Cygnet Park Hampton
Peterborough Cambridgeshire PE7 8GX England
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Contents

1 Introduction

Four potential development scenarios have been considered for the London Southend Airport Joint Area Action Plan (JAAP). The scenarios considered are as follows:

- *Scenario 1: Low growth (do minimum)*
- *Scenario 2(a): Medium growth*
- *Scenario 2(b): Medium growth – 'Aviation Cluster'*
- *Scenario 3: High Growth.*

Tables 1.1 to 1.4 below and overleaf have summarised the proposed land-uses, as well as the passengers for the airport, for each of the four scenarios to be investigated in this note in terms of trips and traffic impacts. For the proposed B1 uses, the figures referenced represent gross floor area in sq.m.; for the airport the figures referenced represent passengers.

Table 1.1 **Scenario 1**	*Site*	*B1a (Office)*	*B1c (Light)*	*Airport Passengers*	*Total*
	ii(a)	-	-	-	-
	ii(d)	-	-	-	-
	iv	9,000	6,000	-	15,000
	Airport	-	-	Similar to existing	Similar to existing

Table 1.2 **Scenario 2(a)**	*Site*	*B1a (Office)*	*B1c (Light)*	*Airport Passengers*	*Total*
	ii(a)	29,250	19,500	-	48,750
	ii(d)	-	-	-	
	iv	9,000	6,000	-	15,000
	Airport	-	-	Similar to existing	Similar to existing

Table 1.3 **Scenario 2(b)**	*Site*	*B1a (Office)*	*B1c (Light)*	*Airport Passengers*	*Total*
	ii(a)	29,250	19,500	-	48,750
	ii(d)	-	-	-	
	iv	9,000	6,000	-	15,000
	Airport	-	-	2 million passengers	2 million passengers

Table 1.4 **Scenario 3**	*Site*	*B1a (Office)*	*B1c (Light)*	*Airport Passengers*	*Total*
	ii(a)	29,250	19,500	-	48,750
	ii(d)	18,000	12,000	-	*30,000*
	iv	9,000	6,000	-	15,000
	Airport	-	-	2 million passengers	2 million passengers

2 Methodology

2.1 Trip Rates

With regard to the constituent uses of the proposed mixed-use development, the assessment of the related trips has been undertaken using analogous sites as presented within the TRICS database.

The TRICS (Trip Rate Information Computer System) database contains survey counts undertaken for different land-use sites across the UK and has been interrogated for analogous sites for the proposed operations.

The characteristics used for this assessment are primarily against the background of proposed floor areas, but also locational and operational characteristics of the proposals, such as public transport accessibility and parking ratio. The land-uses explicitly considered within the modelling comprise: (i). *B1(a) Office*, and (ii). *B1(c) Light Industrial*.

As different land-uses result in different trip behaviour, the assessment was undertaken on calculations being applied to each of the constituent uses within the overall development. This may have the effect of overestimating the level of trips that the site as a whole would likely generate with multiple uses in proximity to each other, though it is considered marginal as for different employment uses in the same area trip linkage is typically limited.

2.1.1 B1 (offices)

In order to find similar sites the 'Business Park' category in the TRICS database was interrogated, initially considering only sites surveyed from 2000 onwards. Within the TRICS database the definition of 'Business Park' is a 'collection of office buildings hosting separate organisations'.

There is also an 'Office' category in the TRICS database, but a review of those sites was not considered analogous at this stage in that those sites were either single buildings hosting a number of separate organisations or a group of buildings belonging to a single organisation.

Only sites in UK were considered and of the sixteen sites initially available four were discounted; three sites were discounted as a result of location in a large strategic conurbation (a site in Greater London - ref. KI-02-B-01, a site in Greater Manchester - ref. GM-02-B-03, and a site in Newcastle - ref. TW-02-B-01. A further site in Coventry (ref. WM-02-B-01) was discounted as a result of being formed more by general industry and wholesale warehouses.

Thus, from the initial selection there were twelve remaining sites generated from the database. Full details of the related TRICS outputs are attached at **Appendix 1**, with **Table 2.1** summarising the car trip rates generated.

	AM PEAK		PM PEAK	
Average Value	Arrivals	Departures	Arrivals	Departures
	1.52	0.179	0.168	1.22

Table 2.1 Summary of TRICS Car Trip Rates for B1 office (per 100 sq.m.)

2.1.2 B1 (Light Industrial)

As for the B1 (office) land-use, the TRICS database was interrogated for the B1 (light industrial) land-use. Sites in the 'Industrial Estate' category surveyed from 2001 onwards with the multi-modal trip-rates were first considered and again only for the UK.

Also similarly to the considerations for the B1(a) use, though the TRICS database also has a 'Industrial Unit' category it was considered that given the development area quantums there would be a number of units for B1(c) use available, thus more so analogous with an industrial estate.

Of the eleven sites initially available a site in Greater London (ref. WH-02-D-01) was first discounted due to a location in a strategic conurbation. A further three sites were also discounted, for varying reasons; a site in Suffolk (ref. SF-02-D-02) was excluded due to the scale of the site, a site in Kingston upon Hull (ref. KH-02-D-02) was excluded because the overall area was considered too small, and a site in Northumberland (ref. NB-02-D-01) was excluded given that industrial estate also included some residential development and the 'Fire & Rescue Service' headquarters.

Thus, from the initial selection there were seven remaining sites generated from the database. Full details of the related TRICS outputs are attached at **Appendix 1**, with **Table 2.2** summarising the car trip rates generated.

	AM PEAK		PM PEAK	
Average Value	Arrivals	Departures	Arrivals	Departures
	0.332	0.178	0.108	0.275

Table 2.2 Summary of Car Trip Rates for B1 light industrial (per 100 sq.m.)

2.2 Modal Split

Further analysing the twelve sites considered for the B1 (offices) component of the proposed development, it is noted that for each of the sites approximately 90% to 95% of persons were using private vehicles with a typical vehicle occupancy of approximately 1.1 persons per vehicle, thus suggesting a significant proportion of single occupancy vehicle trips.

According to Table KS15P of the 2001 census data, in Southend-on-Sea the percentage of people who usually travel to work by public transport (train and/or bus) is typically between 15% and 25%. Moreover, one of the objectives of the Southend-on-Sea LTP (2006 to 2011) is to ensure that by 2010/11 20% of vehicles during the AM Peak on key routes to the town centre have more than 1 occupant (*Targets TC2 in Table 11.2 therein*).

Considering the existing modal split in the area and the proposed improvements to the public transport system, as well as the fact that the proposals would be supported by a comprehensive Travel Plan in order to encourage sustainable non-car modes of transport, a reduction factor has been applied to the trip rates generated by the TRICS site for the B1 office use of the development so that these are 75% of those first generated.

This is considered to be a reasonable assumption considering the location of the proposed development in relation to the public transport opportunities and also considering that the quantum of employment floorspace in a single location would allow for a stronger Travel Plan to be developed. Thus, not applying a reduction factor in trips would overestimate the resultant impacts of the development to the local area.

Table 2.3 below summarises the resultant car trip rates which have been assumed for the transport impacts analysis of the proposed development.

	AM PEAK		PM PEAK	
Average Value	Arrivals	Departures	Arrivals	Departures
B1(a) Office	1.140	0.134	0.126	0.915
B1(c) Light Industry	0.332	0.178	0.108	0.275

Table 2.3 Summary of Analysis Car Trip Rates (per 100 sq.m.)

2.3 London Southend Airport Expansion

In Scenarios 2(b) and 3 it has been considered that the airport would work at a predicted capacity of 2 million passengers per annum. In the absence of a forecasted flight schedule, a broad estimation of the likely car trips to and from the airport (passengers and staff) has been undertaken.

Southampton Airport has been used as a similar example in terms of passengers and likely modal split for the proposal at London Southend Airport. **Table 2.4** summarises the main assumptions made to calculate the likely trips generated by the airport considering 2 million passengers per year, which lead to the modelling assumption of there being up to 1,000 two-way vehicles to and from the airport in the peak hour (and with a 50-50 split of 500 vehicles arriving and 500 vehicles departing).

2000000	**Year Pax**	
6594	Daily Pax	
3297	Pax each-way	
2637	80% Pax by car and taxi	
Modal Split		
Public Transport	20%	*Vehicle Occupancy*
Taxi	16%	2.0
Park-and-fly	32%	2
Kiss-n-fly	32%	2
Passengers Private Vehicles / Taxis		
P and Fly	422	
Kiss n Fly	844	
Taxi	422	
Daily private vehicles / taxis each-way	1688	
Peak hour arrivals	10%	
Peak hour private vehicles / taxis	169	
Staff	2,000	
Present on average weekday	70%	
Car Driver mode share	80%	
Reporting in Peak Hour	25%	
Peak Hour Cars	280	
Service Vehicles		

Service deliveries other misc.	10%
Delivery Vehicles	45
Total	**494**

Table 2.4 Main Assumptions to calculate Airport Vehicle Trips

2.4 Trip Generation

Considering the proposed gross floor areas and the assumed trip rates for the constituent land-uses, as well as additional airport activity, **Tables 2.5 to 2.8** present the likely trips generated by each scenario. The data in the tables have been used for the junction capacity assessments of the proposals.

Scenario 1	**AM PEAK**		**PM PEAK**	
	Arrivals	Departures	Arrivals	Departures
B1 Office	103	12	11	82
B1 Light Industry	20	11	6	17
Total	123	23	18	99

Table 2.5 Summary of Development Vehicle Trips – Scenario 1

Scenario 2(a)	**AM PEAK**		**PM PEAK**	
	Arrivals	Departures	Arrivals	Departures
B1 Office	436	51	48	350
B1 Light Industry	85	45	28	70
Total	521	97	76	420

Table 2.6 Summary of Development Vehicle Trips – Scenario 2(a)

Scenario 2(b)	**AM PEAK**		**PM PEAK**	
	Arrivals	Departures	Arrivals	Departures
B1 Office	436	51	48	350
B1 Light Industry	85	45	28	70
Airport	500	500	500	500
Total	1021	597	576	920

Table 2.7 Summary of Development Vehicle Trips – Scenario 2(b)

Scenario 3	**AM PEAK**		**PM PEAK**	
	Arrivals	Departures	Arrivals	Departures
B1 Office	641	76	71	515
B1 Light Industry	125	67	41	103
Airport	500	500	500	500
Total	1266	642	611	1118

Table 2.8 Summary of Development Vehicle Trips – Scenario 3

2.5 Development Impact Assessment

The design year that has been assumed for the purpose of this assessment is 2021, which ties in with the modelling periods being worked on by WS Atkins. Thus, the impacts of the proposed development in terms of transportation and trips movements will be duly assessed in that year.

A SATURN A.M model was built by WS Atkins on behalf of Southend-on-Sea Borough Council as part of the A127 corridor study to ascertain impacts of proposed developments on the highway network. Predicted traffic flows used for this assessment work have been extracted from this model but amended to reflect the additional trips and network changes relating to the JAAP scenarios. These junction turning counts from the revised models are those used for the impacts assessment herein.

The 2021 forecast model network developed by WS Atkins included the following highway improvements on the A127 corridor:

a) Progress Road / The Fairway junction;

b) Cuckoo Corner roundabout being replaced with signal operations;

c) Fairfax Driver / Priory Crescent junction;

d) Victoria Circus roundabout – being replaced with signal operations.

It also included the development proposed as part of the relocation of the Southend United Football Club stadium to Fossetts Farm, at Roots Hall and Eastern Avenue. Also, airport development and others included in the forecast were modelled explicitly, but with the overall growth across the borough controlled to the TEMPRO forecasts.

2.6 Junction Capacity Assessments

In order to assess the impacts of the proposed development scenarios on the highway network the following junctions were surveyed:

- proposed access(es) for each development option;
- B1013 Nestuda Way / Eastwoodbury Lane roundabout;
- A127 Prince Avenue / B1013 Nestuda Way / Thanet Grange roundabout;
- A127 Prince Avenue / Rochford Road / Hobleythick Lane signals;
- A127 Prince Avenue / A1159 Manners Way / A1159 Priory Crescent / A157 Victoria Avenue roundabout;
- A1159 Manners Way / Rochford Road / Eastwoodbury Crescent roundabout.

Capacity analyses have been undertaken at these key junctions within the study area to assess the operational characteristics of the local highway network and identify potential areas of concern should traffic levels vary significantly as a result of the proposed development scenarios.

Modelling software which is approved by the Department for Transport (Dft) has been used to determine the operating conditions; for roundabouts this is the ARCADY program, for priority junctions the PICADY program and for stand-alone signalised junctions the LINSIG program.

The operational conditions have been assessed against the background of typical two criteria, reference of flow to capacity (RFC) as a proportion and where a value of one represents theoretical capacity and maximum queue (queue) in terms of vehicles. For signalised junctions the RFC value is replaced by the equivalent degree of saturation measures as a percentage and where a value of 100% represents theoretical capacity.

For all the options, the proposed transport strategy has assumed that, with regard to the development flows, at least 20% of people would use public transport and that average private vehicle occupancy would be 1.2 persons. A robust Travel Plan would be prepared for the proposed development to support the achievement of the above targets, which are in line with current census data for the area and with targets of the Local Transport Plan.

Those assumptions also take in to account the impact likely to be generated by the proposed railway station at the airport, the potential SERT route and the possibility of a Park and Ride close to Cherry Orchard Road to the west of Cherry Orchard Way / Eastwoodbury Lane Roundabout. In order to encourage more sustainable modes of transport, cycle parking according to local standards and minimum car parking provision would be adopted.

The impacts of the proposals upon the wider highway network and the likelihood of the available capacity of the network to cope with the development flows are investigated in the following section.

3 Scenario Transport Assessments

3.1 Scenario 1: Low Growth (do) Minimum

Scenario 1 is an intensification of the existing development at the site, thus access to site iv would be via the existing Aviation Way mini roundabout (as shown in Figure 5.1 of the Issues and Options report). However, it is envisaged that this roundabout junction would be subject to an upgrade.

Table 3.1 below shows the results of the likely operational efficiency of the upgraded roundabout to accommodate both future background and Scenario 1 development flows, in relation to theoretical capacity. The results indicate that the roundabout junction (with proposed upgrade) would operate with an abundance of reserve capacity and no discernible queuing under the future year flows with Scenario 1 development. These results also indicate that a secondary access would not be required in terms of operational capacity, though there may be other benefits in doing so.

Network Link	Scenario 1	
	RFC	Queue
Eastwoodbury Lane E	0.583	1.4
Eastwoodbury Lane W	0.763	3.1
Aviation Way	0.042	0.0

Table 3.1 Eastwoodbury Lane / Aviation Way with Upgrade (Scenario 1)

3.1.1 External Junctions

Beyond the access junction, the five external network junctions were appraised under the same flows conditions. The results of the likely operational efficiency to be afforded at these junctions are summarised in **Tables 3.2 to 3.6**.

Network Link	Scenario 1	
	RFC	Queue
Eastwoodbury Lane E	0.503	1.0
Nestuda Way	0.469	0.9
Eastwoodbury Lane W	0.464	0.9

Table 3.2 Eastwoodbury Lane / Nestuda Way (Scenario 1)

The results indicate that the Eastwoodbury Lane / Nestuda Way roundabout junction would operate well within theoretical capacity and with no discernible queuing on any arms under the future year flows with Scenario 1 in place.

Network Link	Option 1	
	RFC	Queue
Nestuda Way North	1.052	28.6
Thanet Grange	0.558	1.2
Prince Avenue (A127) SE	0.285	0.4
Prince Avenue (A127) W	0.847	5.3

Table 3.3 Nestuda Way / Thanet Grange / Prince Avenue (Scenario 1)

The results indicate that the Nestuda Way / Prince Avenue / Thanet Grange roundabout junction would operate with an abundance of reserve capacity upon one of the A127 approaches and also the Thanet Grange approach, as well as with 15% reserve capacity on the other A127 approach, with no discernible queueing.

However, the modelling suggests that the capacity theoretically available on the Nestuda Way approach may be deficient at peak times under Scenario 1. Thus, this approach could require improvement works to better accommodate the projected flows without a material impact to road users. The projected extent of queue along Nestuda Way during the peak (a.m.) period modelled may be reflective of the significant cross flow running in front of this approach from Prince Avenue (W) to Prince Avenue (E) along a strategic route around Southend, with Nestuda Way as the minor arm. Minor works on the approach arm should be first considered, but a form of signalisation may be beneficial to better distribute capacity.

Network Link	Scenario 1	
	Saturation	Queue (pcu)
Prince Avenue W - Ahead / Left	78.3	34.5
Prince Avenue W - Right	90.2	9.4
Rochford Road – Ahead / Left / Right	92.5	25.8
Prince Avenue W – Ahead / Left	94.4	46.9
Prince Avenue W - Right	73.4	5.8
Hobleythick Lane – Ahead / Left / Right	90.8	20.9

Table 3.4 Prince Avenue / Rochford Road / Hobleythick Lane (Scenario 1)

A Vehicle Actuation system (VA) is active at this junction, therefore the operational cycle time for the junction is variable and dependent upon the variations in the volumes of traffic upon each approach stream at different periods of the day.

The results indicate that the Prince Avenue / Rochford Road / Hobleythick Lane signalised junction would operate within theoretical capacity, and typically with a reserve of about or more than 10% based on a cycle time of 160 seconds. This cycle length would be in excess of that which is normally accepted as standard signals modelling practice, but there are instances at heavily-congested nodes where lengthy cycle times can operate (especially if double-cycled and fully accommodating pedestrians with minimal delay).

Network Link	Scenario 1	
	RFC	Queue
Manners Way (A1159)	0.664	1.9
Priory Crescent (A1159)	1.066	39.2
Victoria Avenue (A127)	0.686	2.1
Prince Avenue (A127)	0.889	7.4

Table 3.5 Manners Way / Priory Crescent / Victoria Avenue / Prince Avenue (Scenario 1)

The results indicate that the Manners Way / Prince Avenue / Priory Crescent / Victoria Avenue roundabout junction would operate with an abundance of reserve capacity upon the Manners Way and Victoria Avenue approaches, as well as with 10% reserve capacity on the Prince Avenue. Queueing on these three approaches would not be excessive.

However, the modelling suggests that the capacity theoretically available on the Priory Crescent approach may be deficient at peak times. Thus, this approach could also require improvement works to better accommodate the projected flows without a material impact to road users.

Given the strategic nature of this junction, the projected extent of queue along Priory Crescent during the peak (a.m.) period modelled may be reflective of the significant cross flow running in front of this approach from both Prince Avenue and Manners Way as traffic heads southwards into town. Minor works on the Priory Crescent approach should be considered in the first instance, but a form of signalisation may be beneficial.

Network Link	Option 1	
	RFC	Queue
Rochford Road NE	0.746	2.9
Manners Way (A1159)	0.238	0.3
Rochford Road SW	0.185	0.2
Eastwoodbury Crescent	0.470	0.9
Access road to the airport	0.056	0.1

Table 3.6 Rochford Road /Manners Way / Eastwoodbury Crescent (Scenario 1)

The results indicate that the Rochford Road / Manners Way / Eastwoodbury Crescent roundabout junction would operate well within theoretical capacity and with no discernible queuing on any arms under the future year flows with Scenario 1 development in place.

3.2 Scenario 2(a): Medium Growth

Scenario 2(a) comprises additional new developments being added to the site, thus in tandem to the existing access via Aviation Way for site iv, a new roundabout junction off Cherry Orchard Way would provide access to site iia (as shown in Figure 5.2 in the Issues and Options Report). This proposed access junction would be supported by a two-lane entry approach. Access to site iv would be afforded via the existing Aviation Way mini-roundabout, as upgraded under Scenario 1, but also the proposed roundabout off Cherry Orchard Way for travel to and from the north.

Tables 3.7 and 3.8 show the results of the likely operational efficiencies of the two access junctions to accommodate both future background and Scenario 2(a) development flows, in relation to theoretical capacity.

Network Link	Scenario 2(a)	
	RFC	Queue
Eastwoodbury Lane (E)	0.549	1.2
Eastwoodbury Lane (W)	0.645	1.8
Aviation Way	0.015	0.0

Table 3.7 Eastwoodbury Lane / Aviation Way with Upgrade (Scenario 2(a))

Network Link	Scenario 2(a)	
	RFC	Queue
Cherry Orchard Way(N)	0.644	1.8
Site Access	0.069	0.1
Cherry Orchard Way (S)	0.501	1.0

Table 3.8 Cherry Orchard Way / Proposed Site Access (Scenario 2(a))

The results indicate that both the existing roundabout junction off Aviation Way (with proposed upgrade) and the proposed roundabout junction off Cherry Orchard Way would operate well within their theoretical capacity and with no discernible queueing.

3.2.1 *External Junctions*

As with Scenario 1, beyond the access junctions a further five external network junctions were also appraised and the results of the likely operational efficiency to be afforded at these junctions summarised in **Tables 3.9 to 3.13**.

Network Link	Scenario 2(a)	
	RFC	Queue
Eastwoodbury Lane E	0.499	1.0
Nestuda Way	0.494	1.0
Eastwoodbury Lane W	0.519	1.1

Table 3.9 Eastwoodbury Lane / Nestuda Way (Scenario 2(a))

The results indicate that the Eastwoodbury Lane / Nestuda Way roundabout junction would operate well within theoretical capacity and with no discernible queuing on any arms.

Network Link	Option 2(a)	
	RFC	Queue
Nestuda Way North	1.074	34.8
Thanet Grange	0.563	1.3
Prince Avenue (A127) SE	0.300	0.4
Prince Avenue (A127) W	0.853	5.6

Table 3.10 Nestuda Way / Thanet Grange / Prince Avenue (Scenario 2(a))

The results indicate that the Nestuda Way / Prince Avenue / Thanet Grange roundabout junction would continue to operate with an abundance of reserve capacity on one of the A127 approaches and also the Thanet Grange approach, as well as with 15% reserve capacity on the other A127 approach with no discernible queueing.

Given the results of the modelling work undertaken in relation to Scenario 1, without any modifications to either the Nestuda Way approach alone or to the junction as a whole, the modelling continues to suggest that the capacity theoretically available upon this approach may be deficient during peak periods under Scenario 2(a). This again is most likely reflective of the heavy cross flow along the A127 in front of this arm. Considerations of the extent and form of works to better accommodate the projected network flows as a result of Scenario 1 development would equally inform those to better accommodate Scenario 2(a) development, because the operational deficiencies between the two are not materially different (a further six vehicles in a single queue). Thus, though minor works would be considered first, a form of signalisation may be better.

Network Link	Scenario 2(a)	
	Saturation	Queue (pcu)
Prince Avenue W - Ahead / Left	77.9	34.3
Prince Avenue W - Right	95.9	11.5
Rochford Road – Ahead / Left / Right	88.1	23.0
Prince Avenue W – Ahead / Left	93.7	45.0
Prince Avenue W - Right	74.0	5.9
Hobleythick Lane – Ahead / Left / Right	100.5	30.1

Table 3.11 Prince Avenue / Rochford Road / Hobleythick Lane (Scenario 2(a))

As referenced in relation to the Scenario 1 modelling, a Vehicle Actuation system (VA) is active at the junction and therefore the cycle time of the junction is variable, as can the green times given to phases on a cycle-by-cycle basis. Under a VA system, the operations would seek to maintain green timings to better balance capacity in relation to the demands.

Notwithstanding that the results indicate that two of the traffic streams operate within theoretical capacity but with a reserve of less than 10%, and that a further traffic stream operates at theoretical capacity, other than upon the Hobleythick Lane approach to the signalised junction there would be little difference in operational efficiency at this junction between the flows with Scenario 2(a) development and flows with Scenario 1 development.

However, given the increase in the extent of queue along the Hobleythick Lane approach and that a number of the approaches would be running near to theoretical capacity, further investigations to the signal timings and the VA operations may be beneficial as these stand-alone models may not be wholly reflective of the conditions currently on the ground.

Network Link	Scenario 2(a)	
	RFC	Queue
Manners Way (A1159)	0.685	2.1
Priory Crescent	1.144	67.9
Victoria Avenue	0.725	2.6
Prince Avenue (A127)	0.948	13.8

Table 3.12 Manners Way / Priory Crescent / Victoria Avenue / Prince Avenue (Scenario 2(a))

The results continue to indicate that the Manners Way / Prince Avenue / Priory Crescent / Victoria Avenue roundabout junction would operate with an abundance of reserve capacity upon the Manners Way and Victoria Avenue approaches and with indiscernible queueing upon each. Reserve capacity upon the Prince Avenue approach would be little more than 5%, but the resultant increase in queueing would equate to a further six vehicles.

The modelling suggests that the capacity theoretically available on the Priory Crescent approach would most likely be deficient at least at peak times, but with the increased traffic resulting from the Scenario 2(a) the demonstration of this deficiency (extent of queue particularly) would be exacerbated compared to Scenario 1.

It continues to be considered that, for some part at least, the operational deficiency of the Priory Crescent approach is likely to be reflective of the significant cross flow running in front of this approach as traffic heads along the strategic route into town and that with the limited capacity afforded by gaps in this cross flow stream does not match the demands required. Some form of signalisation may be appropriate to better distribute capacity.

Network Link	Option 2(a)	
	RFC	Queue
Rochford Road NE	0.750	2.9
Manners Way (A1159)	0.329	0.5
Rochford Road SW	0.172	0.2
Eastwoodbury Crescent	0.469	0.9
Access road to the airport	0.057	0.1

Table 3.13 Rochford Road /Manners Way / Eastwoodbury Crescent (Scenario 2(a))

The results indicate that the Rochford Road / Manners Way / Eastwoodbury Crescent roundabout junction would continue to operate well within theoretical capacity and with no discernible queuing on any of the arms under Scenario 2(a).

3.3 Scenario 2(b): Medium Growth – 'Aviation Cluster'

Scenario 2(b) is reflective of Scenario 2(a) in terms of employment development quantums being considered, with the difference being additional consideration of the intensification of flights at the airport. In support of additional airport activity, Eastwoodbury Lane would be diverted and it would intersect with Cherry Orchard Way as a left-in/left-out only junction (as shown in Figure 5.3 in the Issues and options Report). The two access junctions as mapped out for Scenario 2(a) would be maintained in Scenario 2(b). A further access roundabout junction for site iia would be afforded off Cherry Orchard Way north of that tabled for Scenario 2(a) to better afford a distribution of development-related traffic.

Tables 3.14 to Tables 3.16 show the results of the likely operational efficiencies of the three access junctions to accommodate both future background and Scenario 2(b) development flows in relation to capacity.

Network Link	Scenario 2(b)	
	RFC	Queue
Eastwoodbury Lane (E)	0.000	0.0
Eastwoodbury Lane (W)	0.057	0.1
Aviation Way	0.052	0.1

Table 3.14 Eastwoodbury Lane / Aviation Way with Upgrade (Scenario 2(b))

Network Link	Scenario 2(b)	
	RFC	Queue
Cherry Orchard Way (N)	0.543	1.2
Site Access	0.097	0.1
Cherry Orchard Way (S)	0.425	0.7

Table 3.15 Cherry Orchard Way / Proposed Site Access 1 (Scenario 2(b))

Network Link	Scenario 2(b)	
	RFC	Queue
Cherry Orchard Way (N)	0.772	3.3
Site Access	0.058	0.1
Cherry Orchard Way (S)	0.404	0.7

Table 3.16 Cherry Orchard Way / Proposed Site Access 2 (Scenario 2(b))

The results indicate that both the existing roundabout junction off Aviation Way (with proposed upgrade) and the proposed roundabout junctions off Cherry Orchard Way would operate well within their theoretical capacity and with no discernible queuing under Scenario 2(b). However, internal assignment and connectivity may have to be better addressed, as the Aviation Way junction would be little used.

3.3.1 Eastwoodbury Lane

As referenced previously, access arrangements to support Scenario 2(b) would require amendments to Eastwoodbury Lane and thus a further limited movements junction with Cherry Orchard Way. **Table 3.17** summarises the results of this proposed arrangement under the Scenario 2(b) development flows conditions.

Network Link	Scenario 2(b)	
	RFC	Queue
Nestuda Way (North)	0.000	0.0
Eastwoodbury Lane	1.094	133
Nestuda Way (South)	0.000	0.0

Table 3.17 Nestuda Way / Eastwoodbury Lane - Proposed T-Junction (Scenario 2(b)

As the results indicate, the provision of a limited movements junction between Nestuda Way and Eastwoodbury Lane for general traffic would not afford sufficient capacity to accommodate the projected flows, with the approach stream operating at nearly 10% in excess of the theoretical capacity and excessive queueing (in excess of 100 vehicles).

Should there be a need to continue to afford a limited movements junction for general traffic at this location, as it is evident through the modelling that the mainline traffic stream is of such a magnitude to starve the minor approach stream of capacity, an alternative junction type would be better suited at this location. If the flows are relatively balanced a roundabout junction could be suitable; otherwise, signalisation may be a better solution.

Alternatively, Eastwoodbury Lane could be closed to general traffic and designated as a bus-only route. Based on this alternative scenario, **Table 3.18** summarises the results of this alternative proposed arrangement.

Network Link	Scenario 2(b) variant 1	
	RFC	Queue
Nestuda Way (N)	0.000	0.0
Eastwoodbury Lane	0.024	0.0
Nestuda Way (South)	0.000	0.0

Table 3.18 Nestuda Way / Eastwoodbury Lane - Proposed Bus Only T-Junction

The results show how this variant would accommodate the flow of traffic through the access point, if designed to allow only buses. By designating the diverted Eastwoodbury Lane as a bus-only link the priority junction would operate well within theoretical capacity, indeed with little actual capacity used and no queueing.

3.3.2 External Junctions

As with the previous development scenarios, a further five external junctions were appraised under the future flows but with Scenario 2(b) development in place. The results of the likely operational efficiency to be afforded at these junctions are summarised in **Tables 3.19 to 3.23**.

Network Link	Scenario 2(b)		Scenario 2(b) variant 1	
	RFC	Queue	RFC	Queue
Eastwoodbury Lane E	0.550	1.2	0.459	0.8
Nestuda Way	0.462	0.9	0.386	0.6
Eastwoodbury Lane W	0.706	2.4	0.485	0.9

Table 3.19 Eastwoodbury Lane / Nestuda Way (Scenario 2(b))

The results continue to indicate that the Eastwoodbury / Nestuda Way roundabout junction would continue to operate within theoretical capacity and with no discernible queueing on any arms under the future year flows under Scenario 2(b) - without or with the bus-only link.

Network Link	Option 2(b)		Option 2(b) variant 1	
	RFC	Queue	RFC	Queue
Nestuda Way North	0.867	5.9	1.144	69.0
Thanet Grange	0.473	0.9	0.557	1.2
Prince Avenue (A127) SE	0.448	0.8	0.416	0.7
Prince Avenue (A127) W	0.654	1.9	0.804	4.0

Table 3.20 Nestuda Way / Thanet Grange / Prince Avenue (Scenario 2(b))

The results indicate that the Nestuda Way / Prince Avenue / Thanet Grange roundabout would operate with reserve capacity upon all approaches, as well as with no discernible queueing, with diversion of Eastwoodbury Lane and provision of a limited movements junction onto Nestuda Way, in contrast to the previous development scenarios.

However, the previously-identified operational inefficiency of the Nestuda Way approach would again be evident and significantly exacerbated with the introduction of the diverted Eastwoodbury Lane as a bus-only link; this principally reflects a combination of the Nestuda Way approach having to cede priority to a significant cross flow from Prince Avenue (W) to Prince Avenue (E) and the reassignment of traffic as a result of the bus-only link.

As considered with the previous development scenarios considered, though minor works on the approach would be first considered, a form of signalisation may be more appropriate to accommodate the projected traffic volumes and patterns should there be a provision of a bus-only link.

Network Link	Scenario 2(b)		Scenario 2(b) variant 1	
	Saturation	Queue (pcu)	Saturation	Queue (pcu)
Prince Ave. W – Ahead / Left	64.0	28.2	78.7	34.7
Prince Ave. W – Right	48.0	3.6	34.3	2.5
Rochford Rd – Ahead / L / R	121.3	71.2	198.3	346.5
Prince Ave. E – Ahead / Left	95.3	48.5	86.7	38.6
Prince Ave. E -Right	66.1	5.0	30.6	2.0
Hobleythick Ln – Ahead / L / R	135.4	86.8	140.9	99.6

Table 3.21 Prince Avenue / Rochford Road / Hobleythick Lane (Scenario 2(b))

As referenced previously, under a VA system the operations would seek to maintain green timings and cycle lengths to better balance capacity in relation to the demands. However, the results suggest that under Scenario 2(b) development conditions operational deficiencies evident or emerging from the previous development scenarios would be significantly exacerbated with additional activity and amendments to Eastwoodbury Lane.

Theoretical capacity available on both the Rochford Road and Hobleythick Lane approaches would be significantly exceeded, by at least 20%, with the resultant queueing continuing to increase significantly. Additionally, one of the Prince Avenue streams would be operating close to capacity and with significant queueing, though little different to the previous scenarios.

Evidently, further investigations to the signal timings, signal phasing and staging, and also how reflective the stand-alone models can reflect the conditions on the ground under a VA-operated system, would need to be undertaken, but it may be with the additional and reassigned traffic movements significant works may be required at this junction. Going forward with a bus-only link would lead to a further deterioration.

Network Link	Scenario 2(b)		Scenario 2(b) variant 1	
	RFC	Queue	RFC	Queue
Manners Way (A1159)	0.633	1.7	0.736	2.7
Priory Crescent	1.074	46.6	1.070	46.7
Victoria Avenue	0.780	3.4	0.806	4.0
Prince Avenue (A127)	0.819	4.4	0.706	2.4

Table 3.22 Manners Way / Priory Crescent / Victoria Avenue / Prince Avenue (Scenario 2(b))

The results continue to indicate that the Manners Way / Prince Avenue / Priory Crescent / Victoria Avenue roundabout junction would operate with reserve capacity, of typically no less than 20% on all but the Priory Crescent approach. As with the previous scenarios, there would continue to be capacity deficiencies upon that arm; excess capacity and resultant queueing would be greater than with Scenario 1 but less than with Scenario 2(a).

Similarly, as with the previous scenarios, given that the operational deficiency is likely to be reflective in part of significant cross flow running in front of the Priory Crescent approach, to seek to better distribute available capacity amongst the traffic streams some form of signalisation at this junction may be most appropriate to mitigate deficiencies (at least in part).

Network Link	Option 3A		Option 3B	
	RFC	Queue	RFC	Queue
Rochford Road NE	0.825	4.5	0.886	7.0
Manners Way (A1159)	0.417	0.7	0.310	0.4
Rochford Road SW	0.373	0.6	0.231	0.3
Eastwoodbury Crescent	0.315	0.5	0.215	0.3
Access road to airport	0.431	0.8	0.465	0.9

Table 3.23 Rochford Road /Manners Way / Eastwoodbury Crescent (Scenario 2(b))

The results indicate that the Rochford Road / Manners Way / Eastwoodbury Crescent roundabout junction would continue to operate well within theoretical capacity generally and with no discernible queuing on any of the arms under the future year flows under Scenario 2(b).

3.4 Scenario 3: High Growth

Scenario 3 is reflective of Scenario 2(b), but with additional developments at site iid, thus leading to a further increase in the traffic volumes having to pass through the accesses and travel on the external network. Access arrangements for the development sites would continue to be via a series of three roundabout junctions and there would continue to have to be a diversion of Eastwoodbury Lane with some type of connection with Nestuda Way (as shown in Figure 5.4 in the Issues and Options Report). **Tables 3.24 to 3.27** show the results of the likely operational efficiencies of the three access junctions and that with Nestuda Way.

Network Link	Scenario 3	
	RFC	Queue
Eastwoodbury Lane (E)	0.000	0.0
Eastwoodbury Lane (W)	0.057	0.1
Aviation Way	0.052	0.1

Table 3.24 Eastwoodbury Lane / Aviation Way with Upgrade (Scenario 3)

Network Link	Scenario 3	
	RFC	Queue
Cherry Orchard Way (N)	0.631	1.7
Site Access	0.096	0.1
Cherry Orchard Way (S)	0.564	1.3

Table 3.25 Cherry Orchard Way / Proposed Site Access 1 (Scenario 3)

Network Link	Scenario 3	
	RFC	Queue
Cherry Orchard Way (N)	0.588	1.4
Site Access	0.038	0.0
Cherry Orchard Way (S)	0.477	0.9

Table 3.26 Cherry Orchard Way / Proposed Site Access 2 (Scenario 3)

Network Link	Scenario 3		Scenario 3 variant 1	
	RFC	Queue	RFC	Queue
Nestuda Way (N)	0.000	0.0	0.000	0.0
Eastwoodbury Lane	1.080	129.6	0.015	0.0
Nestuda Way (South)	0.000	0.0	0.000	0.0

Table 3.27 Nestuda Way/Eastwoodbury Lane – Proposed T-Junction (Scenario 3)

As with the previous scenarios, the results indicate that the three roundabout junctions (existing upgraded and wholly new) would operate well within their theoretical capacity and with no discernible queueing under Scenario 3, but as with the previous scenario internal assignment and connectivity may have to better addressed.

Also, similarly to the previous scenario, the results continue to show that as a limited movements priority junction the connection between Eastwoodbury Lane and Nestuda Way would be operating at nearly 10% in excess of theoretical capacity and with excessive queueing, whereas as a bus-only link there would be no capacity deficiencies at this junction. Should there continue to be an aspiration to permit general traffic to pass through this junction, as referenced previously in relation to Scenario 2(b) conditions an alternative junction type would be suited at this location also for Scenario 3 – the type being dependent upon flows distribution.

3.4.1 External Junctions

As with the previous development scenarios, a further five external junctions were appraised under Scenario 3. The results of the likely operational efficiency to be afforded at these junctions are summarised in **Tables 3.28 to 3.32**.

Network Link	Scenario 3		Scenario 3 variant 1	
	RFC	Queue	RFC	Queue
Eastwoodbury Lane E	0.531	1.1	0.472	0.9
Nestuda Way	0.519	1.1	0.425	0.7
Eastwoodbury Lane W	0.716	2.5	0.562	1.3

Table 3.28 Eastwoodbury Lane / Nestuda Way (Scenario 3)

The results continue to indicate that the Eastwoodbury / Nestuda Way roundabout junction would continue to operate within theoretical capacity and with no discernible queueing on any arms under the future year flows with Scenario 3 development in place (without or with the bus-only link).

Network Link	Scenario 3		Scenario 3 variant 1	
	RFC	Queue	RFC	Queue
Nestuda Way North	0.890	7.1	1.160	79.1
Thanet Grange	0.474	0.9	0.548	1.2
Prince Avenue (A127) SE	0.491	1.0	0.450	0.8
Prince Avenue (A127) W	0.630	1.7	0.790	3.7

Table 3.29 Nestuda Way / Thanet Grange / Prince Avenue (Scenario 3)

As with Scenario 2(b), the results indicate that the Nestuda Way / Prince Avenue / Thanet Grange roundabout would operate with reserve capacity upon all approaches, as well as typically with no discernible queueing, with diversion of Eastwoodbury Lane and provision of a limited movements junction onto Nestuda Way. They also indicate that operational inefficiency of the Nestuda Way approach would be evident and further exacerbated with the introduction of the diverted Eastwoodbury Lane as a bus-only link, as a result of there being further development traffic as well as reassigned network traffic.

Network Link	Scenario 3		Scenario 3 variant 1	
	Saturation	Queue (pcu)	Saturation	Queue (pcu)
Prince Ave. W – Ahead / Left	65.6	28.9	78.7	34.7
Prince Ave. W – Right	46.3	3.4	33.1	2.4
Rochford Rd – Ahead / L / R	123.6	76.6	198.6	348.1
Prince Ave. E – Ahead / Left	95.4	48.7	86.7	38.6
Prince Ave. E -Right	45.3	3.1	28.8	1.9
Hobleythick Ln – Ahead / L / R	137.6	91.9	141.9	102.1

Table 3.30 Prince Avenue / Rochford Road / Hobleythick Lane (Scenario 3)

The results presented for the Scenario 3 modelling at the Prince Avenue / Rochford Road / Hobleythick Lane signals junction suggest that there would continue to be operational deficiencies in particular along the Rochford Road and Hobleythick Lane approaches to the junctions. However, the additional development under Scenario 3 would not significantly exacerbate the operational deficiencies. Thus, further investigations of the signals operations (current and proposed) would need to be undertaken and that to accommodate the quantum of development under Scenario 3 concurrent with the diversion of Eastwoodbury Lane, and the resultant reassignment impacts of that, may require significant works at the junction.

Network Link	Scenario 3		Scenario 3 variant 1	
	RFC	Queue	RFC	Queue
Manners Way (A1159)	0.599	1.5	0.736	2.7
Priory Crescent	1.044	36.1	1.077	50.2
Victoria Avenue	0.845	5.1	0.817	4.3
Prince Avenue (A127)	0.801	3.9	0.705	3.4

Table 3.31 Manners Way / Priory Crescent / Victoria Avenue / Prince Avenue (Scenario 3)

The results continue to indicate that the Manners Way / Prince Avenue / Priory Crescent / Victoria Avenue roundabout junction would operate with reserve capacity, of typically no less than 15%, on all but the Priory Crescent approach, whilst as with previous scenarios there would continue to be capacity deficiencies upon that arm but again worse than under Scenario 1 conditions but better than under Scenario 2(a).

As referenced previously, a better distribution of the available capacity at the junction between the traffic streams may afford a solution (or at least mitigation) to the capacity deficiency upon this approach; this may be best brought forward through some form of signalisation – either part or in full.

Network Link	Scenario 3		Scenario 3 variant 1	
	RFC	Queue	RFC	Queue
Rochford Road NE	0.891	7.3	0.918	9.3
Manners Way (A1159)	0.460	0.8	0.321	0.5
Rochford Road SW	0.355	0.5	0.220	0.3
Eastwoodbury Crescent	0.392	0.6	0.211	0.3
Access road to airport	0.466	0.9	0.403	0.7

Table 3.32 Rochford Road /Manners Way / Eastwoodbury Crescent (Scenario 3)

The results indicate that the Rochford Road / Manners Way / Eastwoodbury Crescent roundabout junction would continue to operate well within theoretical capacity generally and with no discernible queueing on any arms under Scenario 3, though reserve capacity upon the Rochford Road (NE) approach would be no more than typically 10% and a minor queue would be evident.

4 Conclusion

Halcrow has considered the potential impacts on the highway network within the vicinity of London Southend Airport of four development scenarios, with incremental growth in employment land-use allocations and also in additional activity at the airport.

This technical note has sought to demonstrate the potential requirements and resultant efficiency of access arrangements to support the development scenarios, prior to then considering the likely impacts of each of the development scenarios through assessment of five key network junctions.

With regard to access, the modelling work identifies that an upgrade of the existing roundabout junction between Eastwoodbury Lane and Aviation Way would be sufficient to adequately accommodate the demands of the limited development at site iv associated with Scenario 1. Also, provision of a further roundabout access via Cherry Orchard Way in tandem with the upgraded roundabout would be sufficient to accommodate the demand of the development at site iv and also further development at site iia.

With the introduction of additional activity at the airport as with both Scenarios 2(b) and 3, and also further development at site iid as with Scenario 3, though both the previously-proposed additional access and a further access on Cherry Orchard Way would more than adequately accommodate the projected development demands, internal assignment and connectivity may have to better addressed as the existing junction would be little used.

A further issue with the proposed infrastructure arrangements for the latter scenarios is that a diversion of Eastwoodbury Lane would be required. Modelling of two such options for this, either as a limited movements for general traffic or as a bus-only link has identified that the former arrangement would be significantly deficient of capacity for the minor arm approach, but that the bus-only link would have an abundance of capacity.

However, though the stand-alone modelling of that junction would suggest that a bus-only link should be taken forward, considerations of resultant operational efficiencies elsewhere would suggest that some form of junction accommodating general traffic at Nestuda Lane / Eastwoodbury Lane may be beneficial so a form different to that proposed should be considered.

With regard to network efficiency beyond the access junctions, of the five network junctions independently assessed those of Eastwoodbury Lane with Nestuda Way and Rochford Road with Manners Way & Eastwoodbury Crescent would both operate (all approaches) within theoretical capacity and with varying amounts of reserve capacity and indiscernible queueing.

At the Nestuda Way / Thanet Grange / Prince Avenue junction, with only the limited development of Scenario 1 there would be capacity deficiencies upon the Nestuda Way approach; this would be only marginally exacerbated under Scenario 2(a). As such, minor works upon this approach should be first considered prior to any form of signalisation.

However, under both Scenarios 2(b) and 3, there would not be such a capacity deficiency if the junction between Nestuda Way and Eastwoodbury Lane supported some general traffic streams into and out from Eastwoodbury Lane, unlike with a bus-only link which would sustain this deficiency.

At the Prince Avenue / Rochford Road / Hobleythick Lane signals junction, as this operates under a VA system it is difficult to model current or likely conditions with any certainty. However, work to date suggests that though the junction would operate within capacity under Scenarios 1 and 2(a) (albeit with some evident queueing), conditions upon a number of approaches in particular could be exacerbated under Scenarios 2(b) and 3.

Indeed, with the provision of a bus-only link between Eastwoodbury Lane and Nestuda Way, operational inefficiencies at this junction would be even more so demonstrable. Thus, to accommodate development quantums associated with the latter scenarios, it is evident that the accommodation of some general traffic streams at the Nestuda Way / Eastwoodbury Lane junction would be required in tandem with works at this signals junction.

At the Manners Way / Priory Crescent / Victoria Avenue / Prince Avenue junction, it is evident that for all development scenarios that capacity theoretically available on the Priory Crescent approach would be deficient to accommodate projected demands, but that greater quantums of development of Scenarios 2(b) and 3 could be accommodated better than the Scenario 2(a) quantum (but not of Scenario 1) should a bus-only link not be pursued at the Nestuda Way / Eastwoodbury Lane junction.

Given the consistent poor performance of the Priory Crescent approach, it is suggested that in the first instance minor works upon this approach should be first considered to seek additional capacity, but that potentially some form of signalisation may be required to better distribute the available capacity at the junction between the different traffic streams.

Thus, as an overall conclusion it is suggested that whereas an access strategy for each can be developed, the form of junction between Nestuda Way and Eastwoodbury Lane would need to accommodate some (if not all) general traffic streams turning into and out from Eastwoodbury Lane and that works at a number of the external junctions would need to be considered, especially to accommodate traffic under Scenarios 2(b) and 3.

Appendix A TRICS 2008(a)

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 02 - EMPLOYMENT
Category : B - BUSINESS PARK

VEHICLES

Selected regions and areas:

02	**SOUTH EAST**		
	BU	BUCKINGHAMSHIRE	1 days
	OX	OXFORDSHIRE	1 days
03	**SOUTH WEST**		
	WL	WILTSHIRE	1 days
04	**EAST ANGLIA**		
	CA	CAMBRIDGESHIRE	1 days
	NF	NORFOLK	1 days
	SF	SUFFOLK	1 days
05	**EAST MIDLANDS**		
	LN	LINCOLNSHIRE	1 days
	NT	NOTTINGHAMSHIRE	1 days
06	**WEST MIDLANDS**		
	SH	SHROPSHIRE	1 days
	ST	STAFFORDSHIRE	1 days
	WO	WORCESTERSHIRE	1 days
07	**YORKSHIRE & NORTH LINCOLNSHIRE**		
	NO	NORTH LINCOLNSHIRE	1 days

Main parameter selection:

Parameter: Gross floor area
Range: 1574 to 118448 (units: sqm)

Date Range: 01/01/00 to 17/05/07

Selected survey days:

Monday	2 days
Tuesday	4 days
Wednesday	1 days
Thursday	5 days

Selected survey types:

Manual count	12 days
Directional ATC Count	0 days

Selected Locations:

Town Centre	1
Edge of Town Centre	2
Suburban Area (PPS6 Out of Centre)	5
Edge of Town	13

Selected Location Sub Categories:

Industrial Zone	10
Commercial Zone	2
Residential Zone	2
Retail Zone	1
Built-Up Zone	2
No Sub Category	4

Optional parameter selection:

Use Class:

Not Known	2 days
B1	10 days

Population within 1 mile:

1,001 to 5,000	1 days
5,001 to 10,000	2 days
10,001 to 15,000	3 days
15,001 to 20,000	4 days
25,001 to 50,000	2 days

Population within 5 miles:

50,001 to 75,000	2 days
75,001 to 100,000	4 days
100,001 to 125,000	1 days
125,001 to 250,000	4 days
250,001 to 500,000	1 days

Car ownership within 5 miles:

0.6 to 1.0	7 days
1.1 to 1.5	5 days

Optional parameter selection (Cont.):

Travel Plan:

Not Known	2 days
No	10 days

LIST OF SITES relevant to selection parameters

1 **BU-02-B-01** **BUSINESS PARK, HIGH WYCOMBE** **BUCKINGHAMSHIRE**
LONDON ROAD

HIGH WYCOMBE
Total Gross floor area: 13300 sqm
Survey date: THURSDAY *08/07/04* *Survey Type: MANUAL*

2 **CA-02-B-01** **SCIENCE PARK, CAMBRIDGE** **CAMBRIDGESHIRE**
MILTON ROAD

CAMBRIDGE
Total Gross floor area: 118448 sqm
Survey date: MONDAY *27/11/00* *Survey Type: MANUAL*

3 **LN-02-B-01** **BUSINESS PARK, LINCOLN** **LINCOLNSHIRE**
BISHOPS ROAD

LINCOLN
Total Gross floor area: 4460 sqm
Survey date: TUESDAY *17/05/05* *Survey Type: MANUAL*

4 **NF-02-B-02** **BUSINESS PARK, NORWICH** **NORFOLK**
WHITING ROAD
LONG JOHN'S HILL
NORWICH
Total Gross floor area: 7400 sqm
Survey date: THURSDAY *17/05/07* *Survey Type: MANUAL*

5 **NO-02-B-02** **BUSINESS PARK, SCUNTHORPE** **NORTH LINCOLNSHIRE**
DONCASTER ROAD

SCUNTHORPE
Total Gross floor area: 1574 sqm
Survey date: THURSDAY *22/09/05* *Survey Type: MANUAL*

6 **NT-02-B-01** **BUSINESS PARK, NOTTINGHAM** **NOTTINGHAMSHIRE**
PARK LANE

NOTTINGHAM
Total Gross floor area: 2321 sqm
Survey date: THURSDAY *17/05/07* *Survey Type: MANUAL*

7 **OX-02-B-01** **BUSINESS PARK, OXFORD** **OXFORDSHIRE**
GARSINGTON ROAD
COWLEY
OXFORD
Total Gross floor area: 33105 sqm
Survey date: TUESDAY *21/10/03* *Survey Type: MANUAL*

8 **SF-02-B-01** **BUSINESS PK, BURY ST EDMUNDS** **SUFFOLK**
KEMPSON WAY

BURY ST EDMUNDS
Total Gross floor area: 2480 sqm
Survey date: WEDNESDAY *10/05/06* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

9 **SH-02-B-01** **BUSINESS PARK, SHREWSBURY** **SHROPSHIRE**
WELSHPOOL ROAD

SHREWSBURY
Total Gross floor area: 17197 sqm
Survey date: TUESDAY *14/06/05* *Survey Type: MANUAL*

10 **ST-02-B-03** **BUSINESS PARK, STAFFORD** **STAFFORDSHIRE**
FRANK FOLEY WAY
GREYFRIARS
STAFFORD
Total Gross floor area: 4064 sqm
Survey date: THURSDAY *06/07/00* *Survey Type: MANUAL*

11 **WL-02-B-01** **BUSINESS PK,WOOTTON BASSETT** **WILTSHIRE**
HIGH STREET
COPED HALL
WOOTTON BASSETT
Total Gross floor area: 2600 sqm
Survey date: MONDAY *02/10/06* *Survey Type: MANUAL*

12 **WO-02-B-01** **BUSINESS PARK, REDDITCH** **WORCESTERSHIRE**
BURNT MEADOW ROAD
MOORS MOAT NTH IND. EST
REDDITCH
Total Gross floor area: 3525 sqm
Survey date: TUESDAY *02/05/06* *Survey Type: MANUAL*

TRIP RATE for Land Use 02 - EMPLOYMENT/B - BUSINESS PARK

VEHICLES

Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 00:30	0	0	0.000	0	0	0.000	0	0	0.000
00:30 - 01:00	0	0	0.000	0	0	0.000	0	0	0.000
01:00 - 01:30	0	0	0.000	0	0	0.000	0	0	0.000
01:30 - 02:00	0	0	0.000	0	0	0.000	0	0	0.000
02:00 - 02:30	0	0	0.000	0	0	0.000	0	0	0.000
02:30 - 03:00	0	0	0.000	0	0	0.000	0	0	0.000
03:00 - 03:30	0	0	0.000	0	0	0.000	0	0	0.000
03:30 - 04:00	0	0	0.000	0	0	0.000	0	0	0.000
04:00 - 04:30	0	0	0.000	0	0	0.000	0	0	0.000
04:30 - 05:00	0	0	0.000	0	0	0.000	0	0	0.000
05:00 - 05:30	0	0	0.000	0	0	0.000	0	0	0.000
05:30 - 06:00	0	0	0.000	0	0	0.000	0	0	0.000
06:00 - 06:30	0	0	0.000	0	0	0.000	0	0	0.000
06:30 - 07:00	0	0	0.000	0	0	0.000	0	0	0.000
07:00 - 07:30	12	17540	0.139	12	17540	0.035	12	17540	0.174
07:30 - 08:00	12	17540	0.424	12	17540	0.047	12	17540	0.471
08:00 - 08:30	12	17540	0.685	12	17540	0.086	12	17540	0.771
08:30 - 09:00	**12**	**17540**	**0.835**	12	17540	0.093	**12**	**17540**	**0.928**
09:00 - 09:30	12	17540	0.620	12	17540	0.105	12	17540	0.725
09:30 - 10:00	12	17540	0.370	12	17540	0.105	12	17540	0.475
10:00 - 10:30	12	17540	0.188	12	17540	0.106	12	17540	0.294
10:30 - 11:00	12	17540	0.144	12	17540	0.103	12	17540	0.247
11:00 - 11:30	12	17540	0.140	12	17540	0.118	12	17540	0.258
11:30 - 12:00	12	17540	0.113	12	17540	0.150	12	17540	0.263
12:00 - 12:30	12	17540	0.144	12	17540	0.344	12	17540	0.488
12:30 - 13:00	12	17540	0.236	12	17540	0.294	12	17540	0.530
13:00 - 13:30	12	17540	0.296	12	17540	0.284	12	17540	0.580
13:30 - 14:00	12	17540	0.323	12	17540	0.176	12	17540	0.499
14:00 - 14:30	12	17540	0.172	12	17540	0.164	12	17540	0.336
14:30 - 15:00	12	17540	0.150	12	17540	0.169	12	17540	0.319
15:00 - 15:30	12	17540	0.118	12	17540	0.193	12	17540	0.311
15:30 - 16:00	12	17540	0.109	12	17540	0.254	12	17540	0.363
16:00 - 16:30	12	17540	0.096	12	17540	0.344	12	17540	0.440
16:30 - 17:00	12	17540	0.079	12	17540	0.496	12	17540	0.575
17:00 - 17:30	12	17540	0.092	**12**	**17540**	**0.620**	12	17540	0.712
17:30 - 18:00	12	17540	0.076	12	17540	0.600	12	17540	0.676
18:00 - 18:30	12	17540	0.043	12	17540	0.347	12	17540	0.390
18:30 - 19:00	12	17540	0.026	12	17540	0.181	12	17540	0.207
19:00 - 19:30	0	0	0.000	0	0	0.000	0	0	0.000
19:30 - 20:00	0	0	0.000	0	0	0.000	0	0	0.000
20:00 - 20:30	0	0	0.000	0	0	0.000	0	0	0.000
20:30 - 21:00	0	0	0.000	0	0	0.000	0	0	0.000
21:00 - 21:30	0	0	0.000	0	0	0.000	0	0	0.000
21:30 - 22:00	0	0	0.000	0	0	0.000	0	0	0.000
22:00 - 22:30	0	0	0.000	0	0	0.000	0	0	0.000
22:30 - 23:00	0	0	0.000	0	0	0.000	0	0	0.000
23:00 - 23:30	0	0	0.000	0	0	0.000	0	0	0.000
23:30 - 24:00	0	0	0.000	0	0	0.000	0	0	0.000
Total Rates:			5.618			5.414			11.032

Parameter summary

Trip rate parameter range selected:	1574 - 118448 (units: sqm)
Survey date date range:	01/01/00 - 17/05/07
Number of weekdays (Monday-Friday):	12
Number of Saturdays:	0
Number of Sundays:	0
Optional parameters used in selection:	NO
Surveys manually removed from selection:	9

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 02 - EMPLOYMENT
Category : D - INDUSTRIAL ESTATE

MULTI-MODAL VEHICLES

Selected regions and areas:

03	**SOUTH WEST**		
	WL	WILTSHIRE	1 days
05	**EAST MIDLANDS**		
	LN	LINCOLNSHIRE	1 days
	NT	NOTTINGHAMSHIRE	1 days
07	**YORKSHIRE & NORTH LINCOLNSHIRE**		
	WY	WEST YORKSHIRE	1 days
08	**NORTH WEST**		
	LC	LANCASHIRE	1 days
	MS	MERSEYSIDE	1 days
09	**NORTH**		
	TW	TYNE & WEAR	1 days

Main parameter selection:

Parameter: Gross floor area
Range: 4555 to 51000 (units: sqm)

Date Range: 01/01/01 to 22/05/07

Selected survey days:

Monday	1 days
Tuesday	2 days
Thursday	2 days
Friday	2 days

Selected survey types:

Manual count	7 days
Directional ATC Count	0 days

Selected Locations:

Suburban Area (PPS6 Out of Centre)	5
Edge of Town	9

Selected Location Sub Categories:

Industrial Zone	7
Residential Zone	2
Built-Up Zone	1
No Sub Category	4

Optional parameter selection:

Use Class:

Not Known	1 days
B1	1 days
B2	2 days
D2	1 days

Optional parameter selection (Cont.):

Population within 1 mile:

1,001 to 5,000	1 days
5,001 to 10,000	1 days
10,001 to 15,000	1 days
15,001 to 20,000	2 days
20,001 to 25,000	2 days

Population within 5 miles:

5,001 to 25,000	1 days
25,001 to 50,000	1 days
50,001 to 75,000	1 days
125,001 to 250,000	2 days
250,001 to 500,000	2 days

Car ownership within 5 miles:

0.6 to 1.0	3 days
1.1 to 1.5	4 days

Travel Plan:

No	7 days

LIST OF SITES relevant to selection parameters

1 **LC-02-D-04** **INDUSTRIAL ESTATE, GARSTANG** **LANCASHIRE**
GREEN LANE WEST

GARSTANG
Total Gross floor area: 4555 sqm
Survey date: FRIDAY *16/06/06* *Survey Type: MANUAL*

2 **LN-02-D-01** **INDUSTRIAL ESTATE, GRANTHAM** **LINCOLNSHIRE**
BELTON LANE

GRANTHAM
Total Gross floor area: 5347 sqm
Survey date: THURSDAY *12/05/05* *Survey Type: MANUAL*

3 **MS-02-D-05** **INDUSTRIAL ESTATE, ST HELENS** **MERSEYSIDE**
BROADOAK ROAD

ST HELENS
Total Gross floor area: 11700 sqm
Survey date: TUESDAY *18/10/05* *Survey Type: MANUAL*

4 **NT-02-D-01** **IND. ESTATE, SUTTON-IN-ASHFLD** **NOTTINGHAMSHIRE**
B6028 STONEYFORD ROAD
STANTON HILL
SUTTON-IN-ASHFIELD
Total Gross floor area: 26400 sqm
Survey date: FRIDAY *30/06/06* *Survey Type: MANUAL*

5 **TW-02-D-06** **INDUSTRIAL ESTATE, N. SHIELDS** **TYNE & WEAR**
NORHAM ROAD
WEST CHIRTON
NORTH SHIELDS
Total Gross floor area: 23000 sqm
Survey date: THURSDAY *19/10/06* *Survey Type: MANUAL*

6 **WL-02-D-01** **IND. ESTATE, WOOTTON BASSETT** **WILTSHIRE**
MARLBOROUGH ROAD

WOOTTON BASSETT
Total Gross floor area: 7050 sqm
Survey date: TUESDAY *03/10/06* *Survey Type: MANUAL*

7 **WY-02-D-02** **INDUSTRIAL EST., HUDDERSFIELD** **WEST YORKSHIRE**
A629 WAKEFIELD ROAD
TANDEM
HUDDERSFIELD
Total Gross floor area: 20824 sqm
Survey date: MONDAY *11/09/06* *Survey Type: MANUAL*

TRIP RATE for Land Use 02 - EMPLOYMENT/D - INDUSTRIAL ESTATE

MULTI-MODAL VEHICLES

Calculation factor: 100 sqm

BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate	No. Days	Ave. GFA	Trip Rate
00:00 - 00:30	0	0	0.000	0	0	0.000	0	0	0.000
00:30 - 01:00	0	0	0.000	0	0	0.000	0	0	0.000
01:00 - 01:30	0	0	0.000	0	0	0.000	0	0	0.000
01:30 - 02:00	0	0	0.000	0	0	0.000	0	0	0.000
02:00 - 02:30	0	0	0.000	0	0	0.000	0	0	0.000
02:30 - 03:00	0	0	0.000	0	0	0.000	0	0	0.000
03:00 - 03:30	0	0	0.000	0	0	0.000	0	0	0.000
03:30 - 04:00	0	0	0.000	0	0	0.000	0	0	0.000
04:00 - 04:30	0	0	0.000	0	0	0.000	0	0	0.000
04:30 - 05:00	0	0	0.000	0	0	0.000	0	0	0.000
05:00 - 05:30	0	0	0.000	0	0	0.000	0	0	0.000
05:30 - 06:00	0	0	0.000	0	0	0.000	0	0	0.000
06:00 - 06:30	0	0	0.000	0	0	0.000	0	0	0.000
06:30 - 07:00	0	0	0.000	0	0	0.000	0	0	0.000
07:00 - 07:30	7	14125	0.175	7	14125	0.093	7	14125	0.268
07:30 - 08:00	7	14125	0.166	7	14125	0.110	7	14125	0.276
08:00 - 08:30	7	14125	0.151	7	14125	0.097	7	14125	0.248
08:30 - 09:00	**7**	**14125**	**0.181**	7	14125	0.081	7	14125	0.262
09:00 - 09:30	7	14125	0.126	7	14125	0.081	7	14125	0.207
09:30 - 10:00	7	14125	0.080	7	14125	0.097	7	14125	0.177
10:00 - 10:30	7	14125	0.129	7	14125	0.113	7	14125	0.242
10:30 - 11:00	7	14125	0.088	7	14125	0.092	7	14125	0.180
11:00 - 11:30	7	14125	0.117	7	14125	0.103	7	14125	0.220
11:30 - 12:00	7	14125	0.115	7	14125	0.132	7	14125	0.247
12:00 - 12:30	7	14125	0.125	7	14125	0.168	**7**	**14125**	**0.293**
12:30 - 13:00	7	14125	0.123	7	14125	0.131	7	14125	0.254
13:00 - 13:30	7	14125	0.132	7	14125	0.126	7	14125	0.258
13:30 - 14:00	7	14125	0.113	7	14125	0.106	7	14125	0.219
14:00 - 14:30	7	14125	0.108	7	14125	0.126	7	14125	0.234
14:30 - 15:00	7	14125	0.099	7	14125	0.117	7	14125	0.216
15:00 - 15:30	7	14125	0.095	7	14125	0.103	7	14125	0.198
15:30 - 16:00	7	14125	0.106	7	14125	0.144	7	14125	0.250
16:00 - 16:30	7	14125	0.081	7	14125	0.182	7	14125	0.263
16:30 - 17:00	7	14125	0.105	7	14125	0.176	7	14125	0.281
17:00 - 17:30	7	14125	0.068	**7**	**14125**	**0.192**	7	14125	0.260
17:30 - 18:00	7	14125	0.040	7	14125	0.083	7	14125	0.123
18:00 - 18:30	7	14125	0.036	7	14125	0.082	7	14125	0.118
18:30 - 19:00	7	14125	0.017	7	14125	0.034	7	14125	0.051
19:00 - 19:30	0	0	0.000	0	0	0.000	0	0	0.000
19:30 - 20:00	0	0	0.000	0	0	0.000	0	0	0.000
20:00 - 20:30	0	0	0.000	0	0	0.000	0	0	0.000
20:30 - 21:00	0	0	0.000	0	0	0.000	0	0	0.000
21:00 - 21:30	0	0	0.000	0	0	0.000	0	0	0.000
21:30 - 22:00	0	0	0.000	0	0	0.000	0	0	0.000
22:00 - 22:30	0	0	0.000	0	0	0.000	0	0	0.000
22:30 - 23:00	0	0	0.000	0	0	0.000	0	0	0.000
23:00 - 23:30	0	0	0.000	0	0	0.000	0	0	0.000
23:30 - 24:00	0	0	0.000	0	0	0.000	0	0	0.000
Total Rates:			2.576			2.769			5.345

Parameter summary

Trip rate parameter range selected:	4555 - 51000 (units: sqm)
Survey date date range:	01/01/01 - 22/05/07
Number of weekdays (Monday-Friday):	7
Number of Saturdays:	0
Number of Sundays:	0
Optional parameters used in selection:	NO
Surveys manually removed from selection:	7