

**VIDEO ANALYSIS OF DRIVER EYE-BEHAVIOUR: POSTAR TECHNICAL  
REPORT: JUNE 2005 (updated MARCH 2006)**

*Paul Barber and Mariana Sanderson  
School of Psychology  
Birkbeck College  
(University of London)*

**SUMMARY**

*This study addresses the question of what people in cars look at, with the focus of interest on outdoor advertising. We analysed video-recordings of the eye movements obtained from a number of drivers and passengers in a specially equipped car as they drove or were driven on routes in a UK city; the recordings were from an earlier study for Postar. Their contents were analysed by a semi-automatic procedure to identify when relevant objects (poster panels) were inspected. The numbers of encounters with these "targets" is reported to give an indication of the opportunity-to-see (OTS) rates associated with them. The visibility of different classes of targets is reported. The basic measure of the visibility of a target is its "hit rate", expressed in terms of the proportion of the participants exposed to the target who fixate it at least once. The first analysis to be reported is of single-decker and double-decker buses with and without posters; for this purpose visibility measures were used that are described as quasi-hit rates. This exploratory analysis was to establish the method's scope for estimating the visibility for a moving observer of actually or potentially mobile targets in real-world environments while the observer is actually or potentially in motion. A wider range of poster panel configurations is then subjected to further analysis and "true" hit rates are estimated for them. Descriptions of the routes taken are provided, with a listing of any fixed panels. The technical and other limitations of the study are considered. Summary values of hit rates are provided.*

**1. INTRODUCTION: Video analysis of driver eye-behaviour**

This report continues a series of studies into what car drivers (and passengers) look at. The direct interest of the research concerns outdoor poster advertising, and though the investigations in general have a wider relevance, this report focusses on the commercial applicability of the research. The present investigation arose from the opportunity provided by what will be termed the Driver Attention Study (DAS) to assess the objects inspected by a group of 72 drivers and passengers, whose eye movements were recorded as they drove or were driven over a short route in a car equipped with an eye-tracker system. The principal purpose of the source study DAS was not to provide a general purpose record, so the suitability of the recordings for other purposes is not guaranteed. Nevertheless the archive of DAS recordings made available qualitative and quantitative evidence of what the participants in that study viewed as a function of their real-world task (driving or being driven) and the real-world environment in which it was done (one of three routes through a shopping, residential or arterial area of a UK city).

The rationale for the use of eye-tracking as an indicator of what people look at is intuitively convincing and reasonably transparent, though there are issues concerning the interpretation of eye movements. For example, as a first principles issue, eye-tracking could even turn out to be random; in principle information could be extracted by the brain from visual input from a series of random locations so long as their visual coordinates were known. On the other hand, randomness may not apply; eye-tracking could be systematic (e.g., left-right, top-to-bottom as in reading text) according to a rule-based scanning sequence. Or there could be some other object-based manner of scanning the environment. In the event, published research is strongly indicative of the fact that people look at “important” objects and locations, and it is this that motivates the adoption of eye-tracking methods, since it follows that the eye track signifies what visual information is used in viewing objects, text, screens and scenes.

The literature on eye movements is extensive, and the topics investigated include reading, searching, driving, scene perception, advertising, and computer interface usability. Research on scene perception and driving is the most relevant to the concerns of the present paper. A useful review of the issues and evidence on scene perception was provided by Henderson and Hollingworth (1998), and on applications of eye-tracking generally by Duchowski (2002); see also Duchowski (2003). Duchowski also reviewed published work on driving (which has mostly focussed on safety rather than the real-world content viewed during driving) and advertising (which has almost exclusively focussed on print advertising). Signage relevant to the outdoor advertising industry is the focus of interest to the present research but the archive could be put to use to elucidate viewing patterns for other signage, including directional road-signs.

Deciding on measure of visibility for this research requires careful consideration. In the academic literature on eye-tracking the contrast is made between first gaze and subsequent gaze durations on a target. The interpretation of contrasts such as this is not uncontroversial; in the case in point it may reflect the difference between the intrinsic visual impact of target and the meaning subsequently extracted from it, a contrast that seems relevant to advertising. A similar contrast may be made between the chance of gazing the target at least once, and the number of times a target is inspected in prolonged viewing. The second contrast is one that is represented in this research in the guise of what we refer to as “hit rates” and “quasi-hit rates”, as explained later.

The estimation of the “true” hit rates for a poster panel, that is, the probability of gazing at the panel, has hitherto been achieved in the Postar research by laboratory-based research. The modelling of visibility has entailed the aggregation of a hit rate score accumulated over the viewing interval as the observer travels towards the panel; and it refers to the probability of at least one fixation on the panel during that interval. It is estimated by summing the contributions of a series of very brief glimpses comprising the opportunities afforded by the target during the viewing interval. The important difference between the measures obtained in the present research and the laboratory-based study is that the former provides the accumulated measure directly, with no mathematical modelling. This is simply because what is seen in the course of the video analysis is the entire exposure of the target to the observer, rather than a short stationary view. In this sense the measures reported are more accurately representative of poster visibility. Reservations to be set against this are discussed elsewhere in the report, but this in principle is a sizable advantage to the method used here.

Visibility modelling (for Postar) has hitherto been based on laboratory-based research. Important contributions of this research reside in the range of visual scenes that may be presented, and the fact that it is possible to obtain precision measurements of the viewer's eye movements. But the observers are stationary, as is the image they view; the only mobile element is the eye itself. Interest clearly lies in enabling visibility to be measured for observers themselves in motion, in a mobile world. Advances in technology mean that increasingly precise measurements of what is fixated will be possible for observers on the move. In general one can anticipate a growing capability to investigate this problem, and the present study is one step along this path. It will be evident that exposure to the wide range of viewing conditions and scene contents will always be a limiting factor that may tend to favour research in the laboratory, and a question that arises is the degree to which findings from real-world dynamic and laboratory research agree.

### **1.1 Logistics and preparation for the video analysis study**

Following the completion of the Driver Attention Study (at the University of Nottingham), the videotapes were deposited at Birkbeck College for safe keeping. There are 72 tapes, each of about 20 minutes duration; they are in NTSC format, which may be significant for any possible commercial use to which they might be put. In any case the quality of the videotapes does not recommend them for this purpose. The information on the videotapes was transferred to compact disks (VCDs) in NTSC/MPEG1 format for greater convenience and proof against degradation and data loss; conversion to VCD format undoubtedly made the archive more usable, and it facilitated the analyses of the information on tape reported below.

The results include a detailed log of the three routes; Appendix 1 summarizes the actions typically required to traverse the routes, and Appendix 3 describes the routes in detail. The analysis of the video-tapes has been done semi-automatically, meaning that much of the work was done by eye, supported by video analysis software. There are several software packages that would support this exercise, and following a survey of the options, the Observer (Noldus) system was chosen. This is a professional system designed for the collection and analysis of observational data ("The Observer Version 5": Noldus Information Technology bv, Wageningen, The Netherlands). The video tape to be analysed is viewed at a controlled rate (either frame by frame or by time-sampling) and the occurrence of predetermined events is recorded by the human observer into a database maintained by the software. The record is organised in terms of a categorization scheme for relevant events designed by the researcher, and event occurrences are noted sequentially, along with their time of occurrence. The decision that a particular event has taken place is a matter of human judgement and is not mediated by software. The role of the computer is to maintain an electronic log of the events in a systematic form to enable future analysis of the incidence of event categories, and contingencies between event categories. Such analyses can be, and in the event were, extremely time-consuming. There are published commentaries on the problems that are met in the course of video-analysis that may help establish the likely yield from such analyses (e.g., Laws and Barber, 1989)<sup>1</sup>. An initial encoding of the sequence of events on each tape was conducted and the Noldus .odf file record was transferred to a series of MS Excel files on VCD. Further video analyses were carried to meet requests prompted by the authors' interim reports. For instance, following a discussion in committee of "dwell time", the record was supplemented by the inclusion of event durations as well as event frequencies.

---

<sup>1</sup> The advice of Dr Laws was obtained for the purpose of drawing up a protocol for event recording.

A sample of the tapes was inspected to assess their possible use for publicity and/or demonstration purposes. As to what is visible on the tapes, the actual research study material tells us nothing more than did the pilot tapes. They are rather uncomfortable to watch inevitably since they are following someone else's eye movements, and while these are often predictable and make good sense, the results are completely lacking in gloss and do not make for a night out at the movies. Events of course unfold as quickly as they do in real time, and the best that could be hoped for was a frame-by-frame examination of the eye movements of someone passing a key site. The eye position marker, as seen on the pilot material, "bobbles" about a good deal, due to the movements of the car-road-driver system, and while these average out in the data, they are rather disconcerting to watch. Appendix 4 presents three frames from one driver record to illustrate the source material.

### **1.2 Overview: Driver Attention Study**

This section is a résumé of the report of the Driver Attention Study (DAS), drawing attention to the salient aspects of the source research. The intention is to make this account as self-standing as possible so there will inevitably be some overlap with the DAS report. It is important to underline that the original DAS research was intended to provide data on how attention is distributed by drivers and passengers in a car when viewing the road ahead; this was the main objective, uncompromised by other parallel or emergent interests. The methodology used provided the opportunity to obtain information concerning what the participants of the original study looked at during their brief travel in the research car and while their eye movements were being recorded. The objective was to facilitate the measurement of attention distance and not to provide high quality video images of the eye-track and any objects viewed. It was not intended to guarantee that what the participants encountered was *fully* representative of UK roadside advertising environments; for this reason the present report provides details of the driving environments and the incidence of different forms of advertising existing during the research. In the event the data extracted from the video recordings proved to be a rich source of evidence about what drivers and passengers look at when on the move (or otherwise) in a car. At the inception of the research, it was suspected that the study might give some data on whether or not actual roadside posters were fixated, and hence demonstrate actual poster visibility, but this was a subsidiary aim of the study and it was evident that these results could play a useful descriptive role, but they would not be suitable for rigorous hypothesis-testing.

The everyday experience of drivers and passengers testifies to the fact that attention is most of the time focussed some way down the road ahead and the focus distance changes with road speed and conditions. It was to estimate the distribution of this focus distance that the original Driver Attention Study was designed and conducted. One very positive feature of the present study should therefore not be overlooked: the objective of the original research was to provide the basis for estimating how the focus of attention is distributed, so no reference to advertising was relevant, nor was it made in instructing the Ss as to their task. It is reasonable to assume that the circumstances of the source study were not only naturalistic but they were also uncontaminated by coaching bias.

The empirical research for the original study was done in 2000 by a partnership between the School of Psychology, Birkbeck College, under the supervision of PJB and the Department of Psychology, University of Nottingham, under the supervision of Professor Geoffrey Underwood.

### 1.3 Method: Driver Attention Study

Eye tracking data were obtained from each subject (S) (also referred to as participant or observer) for an in-car recording session of between 10 and 20 minutes, which allowed the recording of the positions and durations of about 1000 eye fixations per subject. From the set of fixations on the scene from the P's viewing position, a distribution was formed for each P of the corresponding distances down the road (z), and of the locations fixated in the plane at each distance (x,y). This information was derived from the original video tape recordings at the time of the original study.

The principal intended use of these data was to consolidate the basis on which the POSTAR visibility model had been constructed, to incorporate assumptions about the distribution of attention in the direction ahead of the subject (the z attention factor). The driver subjects drove the test car along a route passing through one locality corresponding to the three categories used in POSTAR site classification (Shopping, Residential and Arterial). This was also the classification used in the original Birkbeck eye tracking study. In the other condition the passenger subjects were driven along the route in the front passenger seat.

The three routes taken were agreed on the basis of POSTAR GIS data on poster sites. The point of using routes passing poster sites was to ensure that the driving conditions, under which the eye tracking data for the attention distributions were collected, typified the relevant environments and driving conditions. Instructions to for driving along each of the three routes are provided in Appendix 1 (see also Appendix 3).

The eventual technical recommendation for the research design was for a model to be based on data from a minimum of 12 subjects in each category. This was based on two key evidence-based considerations: (a) the scale of similar studies in the vision science literature, and (b) the results of a pilot study.

The equipment in the source study had to be highly robust to survive the rigours of in-car/on-road testing<sup>2</sup>, which was inevitably reflected in the optical properties of the equipment. For the purposes of the original study, it needed to enable the specification and analysis of gaze coordinates, done in conjunction with a computer-linked data processing unit (see Crundall and Underwood, 1998). From a sample of the video-recorded output from the eye-tracker for a pilot study, it was apparent that it did not qualify as a promising source of publicity material, mainly because of the low resolution quality of the recordings. However, as a preliminary to the present Video Analysis Study, the quality of most of the tapes was judged to be adequate for a moderately detailed and accurate analysis to be undertaken of their contents, and in particular of the objects on which the observers' gaze happened to fall.

### 1.4 Planned Research Design: Driver Attention Study

The research design was an independent groups design, with each subject contributing data in one of the 2 x 2 x 3 combined conditions summarised in Table 1. In addition to Gender (Male vs. Female), there were two Task conditions (Driver vs. Passenger), and three Localities (Shopping, Residential and Arterial). It was aimed to recruit 6 subjects per "cell"; for practical reasons the design was somewhat over-subscribed, and a total of 76 subjects were tested to provide data for the Driver Attention Study. The tapes generated in the course of this investigation represented the primary resource for the present study.

---

<sup>2</sup> The vehicle, which was instrumented for its research purposes, has since been scrapped.

**Table 1:** *Planned research design for on-road eye tracking study*

LOCALITY	Driver		Passenger	
	Male	Female	Male	Female
Shopping	N=6	N=6	N=6	N=6
Residential	N=6	N=6	N=6	N=6
Arterial	N=6	N=6	N=6	N=6

Three issues were raised at the outset of the Driver Attention Study that are pertinent to the Video Analysis Study.

- The representativeness of the subjects used was queried. The method used to recruiting participants for the research was by newspaper advertising; this had worked well in the past, and was accepted by the Nottingham research group's principal and very demanding client (the then Department of Transport). Confirmatory evidence of the people recruited was obtained by a questionnaire reporting salient facts about individuals such as gender, employment, education, etc.
- The representativeness of the road scenes to be experienced by the drivers/passengers in the study also needed to be assured. It was of course impossible to guarantee that the road/traffic/poster environment to which the subjects were exposed was fully representative of the UK as a whole. However, the routes were deliberately designed to take the participants past a range of posters and the new GIS database was useful for this purpose, and provided considerable reassurance on the issue. However, there would be no way to guarantee universality without replicating the study in a full range of cities and other relevant environments. The availability of GIS data on all cities would be a factor to consider here, but the overriding consideration would be the cost. For every new locality costs would have soared, going up by much more than the total cost of the Nottingham study since the entire technology and research team would have to be transported and housed each time at great expense.
- How the subjects were to be instructed about their task was acknowledged as crucial. It was naturally important not to encourage or even sanction unsafe driving, but it was very important for participants to drive (or behave as passengers) just as they would normally do. Therefore considerable care was taken over the instruction of participants, and giving them a suitable amount of time to acclimatize to driving (or being a passenger) in these circumstances. The evidence is that just as people do quite quickly adjust to being taped, so people just as quickly adjust to having their eyes monitored while driving. An additional reassurance on this issue lay in the fact that the Nottingham research group were very experienced in inducting recruits to the use of the eye-tracking vehicle. The researchers' interest in outdoor advertising was not mentioned.

A record was kept of whether or not those serving as passengers were also drivers or not, their age, gender, occupation, education, their driving experience, mileage driven and road type used. Also recorded were relevant details of the weather, visibility and traffic conditions at the time of testing. For each person taking part as an eye-tracking subject, an extended record of their eye movements was made as they drove round a preset route in the assigned locale. The Shopping route was just the longest drive (approximately 3.5 miles long), slightly longer than the Arterial route (about 3.4 miles), while the Shopping route (about 2 miles, thus compensating for the

lower average speed attainable) was the shortest. Traffic conditions dictated the durations of the drives which took between 10 and 18-20 minutes to complete. The initial measurements taken from the video recordings of the observers' eye movements were carried out in the Accident Research Unit of the University of Nottingham, by their most experienced research assistant. She supplied spreadsheets containing the full transcriptions of these recordings, and these recordings were analysed to inform the development of the Postar visibility model.

## 2. METHOD: VIDEO ANALYSIS OF DRIVER EYE-BEHAVIOUR

As noted above the planned design for the Driver Attention Study entailed the testing of 72 drivers and passengers, but the actual data supplied was for 76 individuals. This was helpful in the present study because not all of the VCDs could be used and the oversubscription helped fill gaps. The quality of the VCDs was often too poor for them to be assessed visually, and some tapes were broken into too many incoherent small clips, and with others although they might have been visually assessable, the Observer's software had problems in being able to run smoothly (probably due to the effect of poor quality video material in the MPEG encoding). Finally, a total of 52 were analysed; 26 were of drivers and 26 of passengers whose eye movements were tracked as they drove or were driven on one of three pre-set routes. In the sample, there were 22 female and 30 males. Table 2 shows how the observers were distributed across the different conditions (recall that the planned design for the source study had 6 subjects in each of the lowest order cells).

**Table 2:** Frequency of observers in the three types of routes for the test car

<b>Observers</b>	<b>Routes</b>			<b>Total</b>
<b>Drivers:</b>	<b>Arterial</b>	<b>Residential</b>	<b>Shopping</b>	
Female	4	3	3	10
Male	5	5	6	16
<b>All drivers</b>	<b>9</b>	<b>8</b>	<b>9</b>	<b>26</b>
<b>Passengers:</b>	<b>Arterial</b>	<b>Residential</b>	<b>Shopping</b>	
Female	2	6	4	12
Male	4	5	5	14
<b>All passengers</b>	<b>6</b>	<b>11</b>	<b>9</b>	<b>26</b>
Total female	6	9	7	22
Total male	9	10	11	30
<b>Total all</b>	<b>15</b>	<b>19</b>	<b>18</b>	<b>52</b>

The VCDs were viewed by the video analyst (MWS) who watched them (frame by frame) to record the appearance in and disappearance from the field of view of items that could potentially be used to display a poster. These appearance-disappearance intervals are termed "events" and may be related to the concept of "opportunity to see". The items themselves were single-deckers, double-deckers, phone boxes, bus shelters, taxis and free-standing posters such as hoardings and framed street posters. Gazes at and away from any of these objects were recorded via a coding system into the Observer; it was also noted whether the car was stationary or moving. Appendix 2 presents an outline of the coding scheme, followed by sample of the detailed coding to which the VCD recordings were subjected.

### 3. RESULTS

#### 3.1 FIRST PASS ANALYSES AND FINDINGS

An important consideration in any attempted interpretation of the results of the video analysis is whether or not the participants were exposed to a satisfactory number of poster panels in their various guises; in the context of Postar's Inclusivity Project, those of principal interest were single and double-decker buses, bus-shelter poster panels, freestanding roadside panels, taxis and telephone boxes. Accordingly a count was made of the number of each of these that were encountered. Some (taxis and phone boxes) were at the time (2000) of potential rather than actual relevance; a count is reported so that the general representativeness of the environments may be gauged. The objective was to measure the frequency of the presence of each of the above items in the field of view, and as such this provides a rough measure of opportunity to see. The video analysis extended, as is apparent from the relevant Appendices, to what the observers' eyes landed on.

The terminology directly below includes references to "events", namely occasions when one of the target objects of interest was in the field of view, and as noted above the term is clearly linked to the concept of "opportunity to see". The following lists the frequencies of the various key events that could be noted by careful inspection of the tapes.

##### **Single-decker buses**

*There were 713 "events" when there was one or more single-decker bus in the field of view. There were 487 events where one single-decker was in view, 185 events where two were in view, 32 events where three were in view, 8 events where there were four in the field of view and one event with five or more single-deckers in view. Thus there was a total of 990 single-decker targets.*

##### **Double-decker buses**

*There were 358 events when there was one or more double-decker bus in the field of view. On 292 occasions, there was only one double-decker present; on 57 occasions there were two present; for 24 there were three present and for only one occasion there were four double-deckers present. Thus there was a total of 434 double-decker targets.*

##### **'London' style taxis**

*There were 99 events when one or two taxis was in the field of view. For 96 of them only one taxi was in view and for three events two taxis were in view. Thus there was a total of 102 taxi targets.*

##### **Telephone boxes**

*There were 147 events when one or more telephone box was in the field of view. For 39 events there was one box; for 89 events there were two boxes together and on 19 occasions there were three grouped together. Thus there was a total of 274 telephone box targets.*

##### **Bus shelters**

*There were 571 events when one or more bus shelter was in the field of view. For 406 occasions, there was only one bus shelter in the field of view; on 96 occasions there were two bus shelters; on 51 occasions three shelters were in view and on 18 occasions there were four bus shelters in view. Thus there was a total of 823 bus shelter targets.*

##### **Free-standing posters**

*There were 278 events when one or more free-standing poster was in the field of view. For 144 occasions there was one poster; for 62 occasions there were two posters; on 66*

occasions there were three posters; on five occasions there were four posters and on one occasion there were five posters. Thus there was a total of 491 free-standing poster panel targets. There were 479 gazes at free-standing posters.

### **General Comments**

*The counting of gazes presented no problems because there either is or is not a gaze. The counting of items when the car was stopping and starting was more difficult. For example, there is an instance of a line of hoardings set back from a main arterial road on the left hand (passenger) side of the car. The visibility of the hoarding is affected by various factors such as which lane the car is in, the speed of travel, the density of the traffic, the number of parked vehicles. In this instance there was an additional factor in that the hoardings were not parallel to the road but had been angled at about 20 degrees in almost a zig-zag fashion. This meant that if the driver was stopped, or the passenger, they could turn and look at the posters. Indeed if they were stuck in a traffic jam, as occasionally happened, the driver sometimes looked around, and so did the passenger. When the car was moving both driver and passenger subjects generally looked ahead; only occasionally did the passenger look around when on the move*

*The coding was detailed. Ideally it would have been advantageous to have incorporated such information such as whether the target item was static or moving, an estimate of its distance from the observer in the field of view, whether it was on the right or the left of the observer, whether the traffic was light, medium or dense. However, this would have made the analysis even more complex.*

Apropos of the last remark, several questions were raised following a preliminary presentation of the results that necessitated re-analysis of part or the whole of the archive. Like the original analysis, re-analysis of the tapes was very time-consuming. Indeed this report proceeds from this point as if these questions were the principal concern of the research.

A formal reliability study of the raw unprocessed results of the video analysis has not been conducted; this would consist of a study to gauge the agreement between the analyst (MWS) and an independent individual repeating the coding analysis performed by the analyst on a representative selection of the recordings, but it evident that intelligence, Job-like patience and a devoted attention to detail would be needed.

## **4. FIRST PASS ANALYSES: COMPARISONS AND QUASI-HIT RATES FOR BUS POSTERS**

The findings in this section should generally be considered as indicative, and should be viewed with some caution, certainly to the extent that the some of the numbers of observations on which frequencies and other measures including hit rates and quasi-hit rates are based are small. Moreover, the resolution of the eye movement cursor in some of the video recordings was limited, and estimates of eye position were also limited due to the resolution and quality of the video. Finally it should be emphasised that any comparisons made are not underpinned by statistical tests or confidence interval estimates.

### **4.1 Eye gaze at posters on lone single- and double-decker buses**

An investigation was made using the data from the first pass video analysis to examine the incidence and characteristics of lone bus "events" on the tapes; and in particular how they were observed. This was intended to provide an indication of the opportunities afforded to see bus posters on the three DAS routes, as well as an indication of whether they were actually viewed. The lone bus scenario was selected

partly because it is much easier for the analyst to keep track of a single object, and for the reader to interpret the data. It certainly means that there are no other buses, either single or double competing for the observer's attention, or to occlude one another in his or her visual field. Gaze measures, frequencies (or percentages) and durations are relatively straightforward to obtain and understand. It should be stressed, however, that the scores are not the same as the usual hit rate measure in Poststar visibility modelling, which is a measure of whether during an encounter there is at least one gaze at the target (multiple gazes counting as one). In the data that follow, each new fixation (i.e., a re-fixation) adds uniformly to the score for that target.

#### **4.1.1 Single-decker buses**

Aggregating over the three routes, 45.1% of the observations of single-deckers were when the single-decker was the only bus in the field of view defined by the video clip frame. Gazes on these lone single-deckers accounted for 53% of all the events when a single-decker was looked at. As the figures in Tables 3 and 4 show, there were 446 lone single-decker events and 786 gazes upon them, indicating multiple viewings of some but not all buses of that type. There was a lone single-decker in the field of view for 9.3% of the whole journey time aggregated over drivers and passengers. This pattern was not consistent across the different routes driven due to the nature of the routes and the fact that a bus may be at sometimes alone and then joined by another bus or buses and then be alone again. In such cases the gazes made when other buses were present were not included in the count.

The Arterial route was characterised by some of the major access routes into Nottingham, some dual carriageway, with few bus stops. Of the single-deckers that came into the field of view, 85 (76.6%) were the only bus present. There were 125 (100%) occasions when a lone single-decker was gazed on the Arterial route; 46 (36.8%) of the gazes were on lone singles with no visible poster; 68 (54.4%) gazes were on a poster-ed bus but not at a poster; and only 11 (8.8%) gazes were at a poster that was low on the back of the bus. Drivers gazed more frequently at the lone single-deckers than passengers, an indication of that is given if the average number of gazes per observer is computed. For drivers the average frequency of gazes was 11.9 and for the passengers 3.0 but these figures do not mean these are the actual number of gazes per observer (moreover, the difference has not been statistically tested). For only 5.7% of the total of journey times in the Arterial route was there a lone single-decker bus present.

The Residential route was characterised by a preponderance of high density housing, narrow streets that were not very busy. The rest of the route was on main routes that were bus routes. Of the 62 single-deckers seen in the whole of the bus route, 54 (87%) were the only bus present in the field of view; 87% of the single-deckers seen in the whole of the bus route were lone single-deckers and they attracted 125 gazes. There were 89 (71.2%) of the 125 gazes at lone single-deckers that had no visible poster; 29 (23.2%) gazes at a poster-ed single-decker but not at its poster. Drivers looked at more lone single-deckers than passengers. Again the average number of gazes can indicate this. The average number of gazes on lone single-deckers by drivers was 10 and by passengers was 4.1. For only 3.5% of the total journey times in the Residential route was there a lone single-decker bus present.

The majority of the Shopping route was through main shopping streets in the heart of Nottingham. Most of the streets were busy bus routes with a high density of pedestrians and traffic characterised by a lot of buses. In addition, there were a few short stretches of dual-carriageway and major roundabouts. The percentage of lone-

single-deckers, 37.6% (307 lone single-deckers out of a total of 817 single-deckers), in the Shopping route was lower than in the other two routes. This is hardly surprising as the density of traffic was greater in this route. Gazes on the lone singles accounted for 45.4% (536 out of a total of 1182 gazes) of all gazes on single-deckers; 184 (34.3%) of the 536 gazes on the lone single-decker buses were on those that had no visible poster; 289 (53.9%) were on a poster-ed single loner but not on its poster and only 63 (11.8%) were on a poster. Unlike the other two routes, passengers looked more at the lone single-deckers than the drivers. On average, drivers looked at single loners 20.3 times and passengers looked 39.2 times. These figures also demonstrate that there were more target items to look at than in the other runs. Despite the busy nature of the route, there was a lone single-decker in the field of view for 24% of the totalled journey time.

#### **4.1.2 Double-decker buses**

Over the three routes described in the section on single-decker buses section, 53.9% of the appearances of double-decker buses were when a sole double-decker was the only bus in the field of view, as shown on the video clip. Gazes on the lone double-deckers accounted for 57% of all the gazes on double-deckers. As the figures in Tables 5 and 6 show, there were 234 lone double-decker events and 605 gazes upon them, which indicates that there were multiple viewings of those buses. For only 5.1% of the totalled journey time was there a lone double-decker in the field of view. The Tables do not show the full breakdown of gazes on bus posters into poster sub-categories (T-side, Superside, etc.) because the number of instances at this level of analysis was inevitably too small as can be appreciated from the frequencies under "Poster gazed on lone bus" (which applies equally to the single-decker data).

In the Arterial route, the number of lone double events (31) equalled the number of double-deckers counted, but only 31.8% (28) of all gazes were on lone double-deckers. This arose because in some appearances the lone bus was joined by another bus or buses, and the recording of the observer looking at the bus was stopped. Of the gazes on the lone double-deckers 14 (50%) were on a poster-ed bus but not on its poster. As with the single-deckers, drivers gazed more frequently at items than passengers and the average number of gazes per observer illustrates that. The average gazes per driver at lone double-deckers were 2.3 and for passengers 1.3 in the Arterial route. For 3% of the total time of the Arterial journey aggregated over participants, there was a lone double-decker bus present.

In the Residential route, 90.7% (39) of the double-deckers were lone bus appearances, attracting 63.9% (141) of all the 205 gazes on double-deckers. Of the gazes on the lone double-deckers, three (2.3%) were at those with no visible poster; 104 (79.4%) were on those that were poster-ed but the poster was not looked at. The average number of looks on lone double-deckers was 8.4 and for passengers it was 7.1, a less marked difference than for the lone single-deckers. For 2.5% of the totalled time of the Residential journey, there was a lone double-decker present.

The Shopping route, as could be expected, had the highest number of appearances of double-deckers. There were 164 (45.6%) out of 390 double-decker bus appearances that were loners, and 446 (35.8%) of the 769 gazes at double-deckers that were aimed at lone ones. Of the gazes on these lone double-deckers, 4.1% were on buses with no visible poster, 202 (45.3%) were

looks at a poster-ed bus but not at the poster. There were markedly fewer looks at lone double-deckers by passengers than drivers. The average of looks for passengers was 11 but for drivers the average number of looks was 38.6, which was the opposite to the effect found for observers of lone single-deckers in the Shopping route. The lone double-deckers were in view for 11.2% of the totalled Shopping route duration.

**Table 3** Incidence, duration and gaze measures for lone single-deckers with all single-deckers classified by route and task (driver vs. passenger)

Route	Number of lone events	All single-deckers	<u>lone</u> % all	Number of gazes on lone single-deckers	All gazes on single-deckers	<u>lone gazes</u> % all gazes	Duration of whole route (sec)	Duration of lone single-deckers (sec)	Lone time as % of all time
<b>All</b>	446	990	45.1%	786	1482	53.0%	45962	4148	9.3%
<b>Arterial</b>	85	111	76.6%	125	125	100.0%	10820	622	5.7%
<b>Residential</b>	54	62	87.0%	125	175	71.4%	21608	761	3.5%
<b>Shopping</b>	307	817	37.6%	536	1182	45.4%	13534	2766	24.0%
<b>Drivers</b>	229	505	45.4%	370	678	54.6%	23212	2050	9.1%
<b>Passengers</b>	217	482	45.0%	416	704	59.1%	22750	2100	9.4%

**Table 4** Gaze frequencies and durations for lone single-deckers classified by route and task (driver vs. passenger)

Route	Number and type of observers	Duration of whole route (sec)	Duration of lone single-deckers (sec)	Number of lone single-decker events	Lone single-decker gazed, no visible poster	Lone single-decker gazed but not its visible poster	Poster gazed on lone single-decker	Quasi-hit rate (%)
<b>Arterial</b>	9 drivers	6571	402	51	40	57	10	14.9%
<b>Residential</b>	8 drivers	9353	403	28	64	15	1	6.3%
<b>Shopping</b>	9 drivers	7288	1245	150	111	65	7	9.7%
<b>All</b>	26 drivers	23212	2050	229	215	137	18	11.6%
<b>Arterial</b>	6 passengers	4249	220	34	6	11	1	8.3%
<b>Residential</b>	11 passengers	12255	358	26	25	14	6	30.0%
<b>Shopping</b>	9 passengers	6246	1520	157	73	224	56	20.0%
<b>All</b>	26 passengers	22750	2099	217	104	249	63	20.2%
<b>Arterial</b>	15 all	10820	622	85	46	68	11	13.9%
<b>Residential</b>	19 all	21608	761	54	89	29	7	19.4%

<b>Shopping</b>	18 all	13534	2766	307	184	289	63	17.9%
<b>All</b>	52 all	45962	4148	446	319	386	81	17.3%

**Table 5** Comparison of lone double-deckers with all double-deckers that appeared during the drives along the three routes and between drivers and passengers

Route	Number of lone double-decker events	All double-deckers	<u>lone %</u> all	Number of gazes on lone double-deckers	All gazes on double-deckers	<u>lone gazes %</u> all gazes	Duration of whole route (sec)	Duration of lone double-deckers (sec)	Lone time as % of all time
<b>All</b>	234	434	53.9%	605	1061	57.0%	45962	2364	5.1%
<b>Arterial</b>	31	31	100.0%	28	88	31.8%	10820	322	3.0%
<b>Residential</b>	39	43	90.7%	131	205	63.9%	21608	532	2.5%
<b>Shopping</b>	164	360	45.6%	446	769	58.0%	13534	1510	11.2%
<b>Drivers</b>	142	264	53.8%	444	746	59.5%	23212	1649	7.1%
<b>Passengers</b>	92	170	54.1%	161	315	51.1%	22750	715	3.1%

**Table 6** Frequencies of gazes on lone double-deckers described by route and passengers and drivers in each route

Route	Number and type of observers	Duration of whole route (sec)	Duration of lone double-deckers (sec)	Number of lone double-decker events	Lone double-decker gazed, no visible poster	Lone double-decker gazed but not its visible poster	Poster gazed on lone double-deckers	Quasi-hit rate (%)
<b>Arterial</b>	9 drivers	6571	275	21	0	9	12	57.1%
<b>Residential</b>	8 drivers	9353	269	16	0	61	15	19.7%
<b>Shopping</b>	9 drivers	7288	1104	105	6	146	195	57.2%
<b>All</b>	26 drivers	23212	1649	142	6	216	222	50.7%
<b>Arterial</b>	6 passengers	4249	47	10	0	5	2	28.6%
<b>Residential</b>	11 passengers	12255	262	23	3	43	32	42.7%

<b>Shopping</b>	9 passengers	6246	406	59	12	56	31	35.6%
<b>All</b>	26 passengers	22750	715	92	15	104	42	28.8%
<b>Arterial</b>	15 all	10820	322	31	0	14	14	50.0%
<b>Residential</b>	19 all	21608	532	39	3	104	24	18.8%
<b>Shopping</b>	18 all	13534	1510	164	18	202	226	52.8%
<b>All</b>	52 all	45962	2364	234	21	320	264	45.2%

#### 4.1.3 **Discussion: Lone bus results**

There were 1424 buses recorded in the video analysis of the 52 DAS tapes (27.4 per participant). Not surprisingly they were very unevenly distributed over the three routes: there were 142 on the Arterial route (9.5 per participant), 105 on the Residential route (5.5 per participant) and 1177 on the Shopping route (65 per participant). There were nearly twice as many single-deckers than double-deckers; the ratio between singles and doubles was 2.74 for Arterial, 1.38 for Residential and 1.87 for Shopping.

Considering lone buses only, there were 680 altogether (446 single-deckers, 234 double-deckers). Aggregating over bus type, there were 116 on the Arterial route, 93 on the Residential route and 471 on the Shopping route. The proportions of numbers of buses for Arterial, Residential and Shopping were respectively 0.10, 0.07 and 0.83 for all buses (lone or otherwise) and 0.17, 0.14 and 0.69 for lone buses only. The proportions naturally do differ somewhat; the crowdedness of Shopping is partly due to the greater proliferation of buses there, and reflects the smaller chance of encountering a lone bus. If competition between bus posters increases with number of buses in sight, the “quasi-hit rate” for Shopping based on lone buses would be somewhat inflated, but to an unknown degree.

The quasi-hit rate scores are in every case but one higher for double-deckers than for single-deckers (the exception being the pooled Residential case, where singles scored 19.4% and doubles scored 18.8%). Indeed aggregating over route and task, gives a score of 17.7% for singles and 45.2% for doubles. The results otherwise contain a number of interesting features, such as the passenger-driver difference (20.2% vs. 11.6%) for single decker posters, the direction of which reverses for double decker posters (28.8% vs. 50.7%). The relative locations of the posters and of the position of the viewer relative to the bus may explain this (see later for results on “buses approaching”).

As noted at the outset of this section, these findings should be viewed with caution. In particular, the numbers of observations on which frequencies and quasi-hit rates are based are often small, which for instance precluded the calculation of meaningful hit rates for individual bus poster panels. It remains to note that gaze at a double-decker could be directed at any one of a number of its visible poster panels. In this sense a double-decker is like a fixed panel site with more than one panel. In the section devoted to fixed panels below, a hit rate is reported based on the site, and another as a per panel measure. Clearly the site hit rate will be higher than the per panel rate. The hit rate measures for double-deckers reported here should also thought of as site measures. This goes for single-deckers too though very few single presented two visible posters.

Notwithstanding the suggested need for caution in interpreting these findings, it seems clear that the incidence of viewings of buses was satisfactorily high, and that further closer analysis of certain types of encounters with buses should proceed.

## 5. SECOND PASS ANALYSES: TOWARDS HIT RATE ESTIMATION

It is of particular interest that some carefully specified questions about what was potentially or actually viewed by those participating as drivers or passengers in the Nottingham study were formulated after the generic analysis was completed. In the light of the interests expressed by the POSTAR Visibility Subcommittee in response to the interim presentation of results, this Section of the report is organized in terms of these more focussed questions and analyses. The results in the following sections, substantially requiring a second pass through the VCDs, focus on more detailed aspects of bus poster viewing, but are extended to include fixed panel formats. The aim furthermore is to provide a visibility measure operationally closer to that used in Postar visibility modelling.

### 5.1 Encounters with buses at road junctions

One of these questions, necessitating further analysis not allowed for by the generic coding, concerned what took place and was viewable at key road junctions during the drives. Specifically, the videos were re-analysed to code the incidence of buses with and without posters at T-junctions and roundabouts. There were far more data for the Shopping route but results for all three routes are given for completeness.

#### 5.1.1 Shopping route

For the Shopping route, there were 12 such junctions, where a vehicle could potentially pass (and be seen by) the driver/passenger at right angles to his/her line of sight directly down the road ahead. There were 9 Drivers (3 female and 6 male) and 9 Passengers (4 female and 5 male) for whom analysable video recordings of adequate quality and extent were available.

Pooling over the 18 participants and 12 junctions (amounting to 216 encounter-opportunities<sup>3</sup>) there were 269 bus sightings (161 with poster, 108 without); and there were 165 gazes at the 266 buses, and 34 gazes at posters on the 161 postered-buses.

Table 7 summarizes the frequencies and percentages of the various events of interest. Of the 108 buses without a poster, 64 were fixated (59.3%). Of the 161 buses with a poster, 67+34 were fixated (62.7%); and 34 of these 161 opportunities to fixate a poster (33.7%) were taken. The difference between the percentages of buses fixated which did or did not carry a poster (62.7% vs. 59.3%) was very small.

A measure of “hit rate” could reasonably be taken as the number of posters gazed at relative to the number of postered buses encountered, that is,  $100 \times 34 / 161 = 21.1\%$ .

**Table 7:** Gaze frequencies and percentages for bus encounters at junctions on the Shopping route: For drivers and passengers, and their aggregate, pooled over bus type (single vs. double decker)

Poster status	Behaviour	Driver		Passenger		Aggregate	
		Count	%	Count	%	Count	%

<sup>3</sup> This appears to be another variant of “opportunity to see”. But it refers to the conjunction of a person in a location where a target object might occur, so it is wrong to say that OTS was 216. It is an interesting exercise to decide what OTS refers to in this case. For bus posters, as industry-relevant objects to which OTS can properly be linked, the authors consider that there were 161 OTS.

without poster	bus gazed	44	56.4	20	66.7	64	59.3
	bus not gazed	34	43.6	10	33.3	44	40.7
	total without poster	78		30		108	
with poster	Bus gazed but not poster	26	32.9	41	50.0	67	41.6
	Bus not gazed	34	43.0	26	31.7	60	37.3
	poster gazed ("hit rate")	19	24.1	15	18.3	34	<b>21.1</b>
	total with poster	79		82		161	

### 5.1.2 Residential route

Pooling over the 19 participants and 9 junctions (amounting to 171 encounter-opportunities) there were 78 bus sightings (39 with poster, 39 without); and there were 51 gazes at the 78 buses, and 9 gazes at posters on the 39 postered-buses. There were too few observations and encounters with buses to warrant an analysis by task so the results have been pooled over drivers and passengers. Aggregating in this way, the hit rate for bus posters was 23.1%, very close to the result for the Shopping route.

**Table 8:** Gaze frequencies and percentages for bus encounters at junctions on the Residential route: Aggregated over task (drivers vs. passengers) and bus type (single vs. double decker)

Poster status	Behaviour	Aggregate	
		Count	%
without poster	bus gazed	27	69.2
	bus not gazed	12	30.8
	Total without poster	39	
with poster	bus gazed but not poster	15	38.5
	bus not gazed	15	38.5
	poster gazed ("hit rate")	9	<b>23.1</b>
	Total with poster	39	
Total		78	

NOTE: 2 Ss did not encounter a bus on the Residential route.

### 5.1.3 Arterial route

There were even fewer data for the Arterial route. Pooling over the 15 participants and 6 junctions (amounting to 90 encounter-opportunities) there were 35 bus sightings (18 with poster, 17 without); and there were 15 gazes at the 35 buses postered or not, and just one gaze at a poster on the 18 postered-buses. The hit rate aggregated over driver and passenger conditions was 5.6%.

**Table 9:** Gaze frequencies and percentages for bus encounters at junctions on the Arterial route: Aggregated over task (drivers vs. passengers) and bus type (single vs. double decker)

Poster status	Behaviour	Aggregate	
		Count	%
without poster	bus gazed	8	47.1
	bus not gazed	9	52.9

	total without poster	17	
with poster	bus gazed but not poster	6	33.3
	bus not gazed	11	61.1
	poster gazed ("hit rate")	1	<b>5.6</b>
	total with poster	18	
Total		35	

NOTE: 3 Ss did not encounter a bus on the Arterial route.

#### **5.1.4 Buses: aggregating over routes**

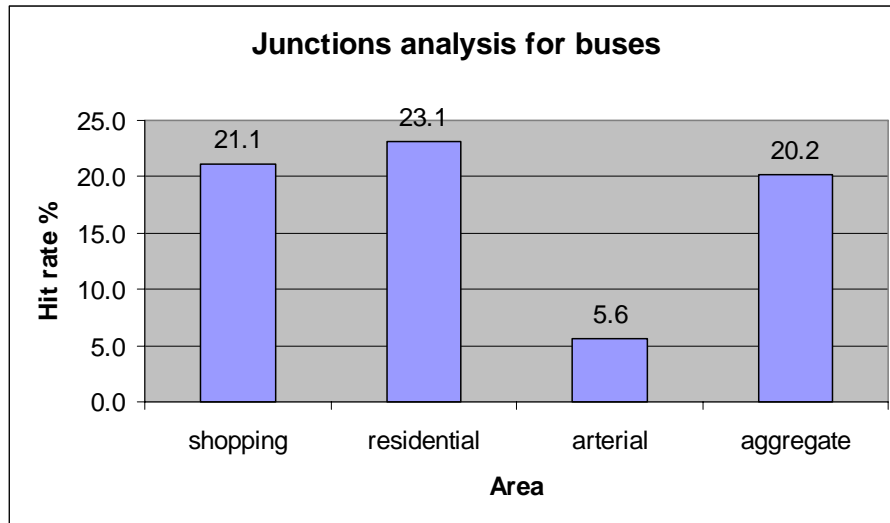
Finally for this section, the results were pooled over Shopping, Residential and Arterial routes. There were 382 bus encounters, of which 218 were with a postered bus. The hit rate for bus posters estimated from the aggregate results was 20.2%. It is noteworthy that the percentage of postered vs. un-postered buses fixated was 60.6% vs. 60.4%, suggesting that although buses are visual attractants, carrying a poster did not by itself add to the attention-getting value of the bus. The hit rates are summarized graphically in Figure 1.

**Table 10:** Gaze frequencies and percentages for bus encounters at junctions pooled over routes: Aggregated over task (drivers vs. passengers) and bus type (single vs. double decker)

Poster status	Behaviour	Aggregate	
		Count	%
without poster	bus gazed	99	60.4
	bus not gazed	65	39.6
	Total without poster	164	
with poster	bus gazed but not poster	88	40.4
	bus not gazed	86	39.4
	poster gazed ("hit rate")	44	<b>20.2</b>
	Total with poster	218	
Total		382	

NOTE: 5 Ss did not encounter a bus on their route.

**Figure 1:** Hit rates for bus posters on buses encountered at road junctions, on the three routes, and aggregated over routes



### 5.2 Bus encounters – offside/nearside

The second analysis of the VCDs was of all encounters with buses other than at junctions, when they were either approaching the driver/passenger subject on the offside (driver-side) or they were being overtaken with the bus on the nearside (passenger-side). The tabulation of these encounters was summarized in a similar fashion to bus/road junction events.

In the case of a bus approaching the test vehicle, there were only three encounters with a bus having no poster, but there were 58 with a bus having a poster (29 for drivers, and 29 for passengers). Taking hit rate as the percentage of postered buses whose poster was fixated at least once, the hit rate for drivers was 43.1%, for passengers 29.3%, giving an aggregate hit rate of 37.0%. The detailed results are in Table 11.

**Table 11:** Gaze frequencies and percentages for encounters with approaching buses pooled over routes: For drivers, passengers, and then as an aggregate over task (drivers vs. passengers), pooled over bus type (single vs. double decker)

Observer type	poster status	poster gazed count		TOTAL	HIT RATE (%)
		NO	YES		
Driver	Without poster	2	n/a	2	
	With poster	29	22	51	<b>43.1</b>
Passenger	Without poster	1	n/a	1	
	With poster	29	12	41	<b>29.3</b>
Aggregate	Without poster	3	n/a	3	
	With poster	58	34	92	<b>37.0</b>

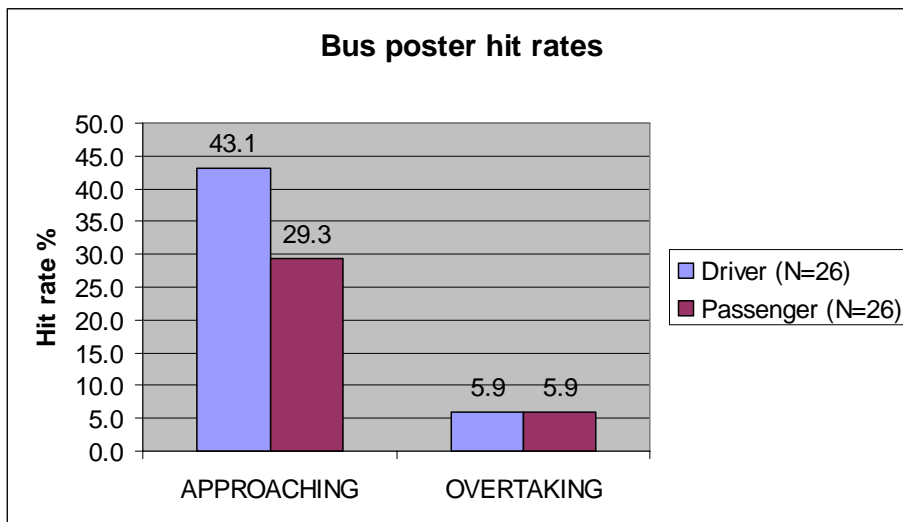
In the case of a bus approaching the test vehicle, there were only three encounters with a bus having no poster, but there were 51 with a bus having a poster (34 for drivers, and 17 for passengers). The hit rate was 5.9% for drivers, for passengers and for the aggregate hit rate. The detailed results are in Table 12.

**Table 12:** Gaze frequencies and percentages for encounters with an overtaken bus pooled over routes: For drivers, passengers, and then as an aggregate over task (drivers vs. passengers), pooled over bus type (single vs. double decker)

Observer type	poster status	poster gazed count		TOTAL	HIT RATE (%)
		NO	YES		
Driver	Without poster	3	n/a	3	
	With poster	32	2	34	5.9
Passenger	Without poster	1		1	
	With poster	16	1	17	5.9
Aggregate	Without poster	4	N/A	4	
	With poster	48	3	51	5.9

The data for approaching buses suggests that the bus poster hit rate for drivers is higher than for passengers. This would result if passengers not only view the bus at a greater eccentricity than drivers, but they also tend to gaze directly down the road ahead. Drivers may glance across at the oncoming bus, to check road position and consequently may glance at any bus poster. The low hit rate for overtaken buses possibly suggests that drivers and passengers both tend to look ahead of the car during an overtaking manoeuvre. The results for these conditions are summarized graphically in Figure 2.

**Figure 2:** Hit rates for bus posters on approaching vs overtaken buses, showing the differences between Driver and Passenger conditions



### 5.3 Buses – hit rates for rear posters

Encounters with buses bearing rear posters were analysed. The results were aggregated over routes because of the small numbers of observations available (76 in all). Not surprisingly, and this is also qualified by the small number of observations, hit rates were quite high, reaching an impressive top score of 61.3% for the driver viewpoint of double-decker rears; this contrasts with their much lower score for single-decker rear posters of 26.7%. Passengers showed no real bias to double-decker over single-decker formats (52.4% vs. 48.0%). Their viewpoint is of course different from that of the driver, who also has the task of attending down the offside road ahead if an overtaking manoeuvre is to be attempted when the bus slows or stops.

**Table 13:** Gaze frequencies and hit rates for bus rear posters

	Single-decker bus			Double-decker bus		
	No of hits on rear poster	No of rear posters encountered	Hit rate	No of hits on rear poster	No of rear posters encountered	Hit rate
Driver	12	45	26.7%	19	31	61.3%
Passenger	33	63	52.4%	12	25	48.0%

### 5.4 Fixed panel sites

Estimation of hit rates for fixed panel sites (free-standing panels and bus-shelter panels) was especially difficult since there were so few of them, and the smaller formats were inevitably harder for the analyst to spot on the low resolution video recordings. Pooling across the three routes there were just 13 free-standing or fixed poster panel sites and 23 bus-shelter poster panel sites, respectively presenting a total of 26 and 36 panels. The aggregation in the case of free-standing panels is over panel sizes ranging from 6 to 48 sheets, though size was often not easy to gauge from the video images. Potentially every participant was exposed to these fixed panels, though for some the track taken by the vehicle in traffic meant that the exposure was minimal. The routes followed for the purpose of data collection were selected so that they passed poster sites, but it was inevitable that there could not be enough of them, and they could not reasonably satisfactorily sample the relevant stock in terms of location. Notwithstanding, relevant data have been extracted from the corpus of observations. Two ways of examining and presenting these data have been employed in this section. First (in Section 3.4.1), statistical summary information is presented for the fixed panels, lacking in varnish just as the rest of the results have been. A problem with these data is that they aggregate the results over a variety of panel formats, including format size as well as mixing solus with multiple panel formats. Therefore, and second (in Section 3.4.2), data are reported for the most unambiguous (i.e., solus) formats; some sectors of the routes contained just one poster panel and so it is possible to estimate the panel hit rate in those instances.

Further information about the distribution of fixed sites over the three routes is presented in the tables that follow. It seems reasonable to characterize these figures as opportunities-to-see (OTS) in each case, for a 15-20 minute exposure. In an unknown number of cases, the panel in question may have been occluded by traffic or otherwise shielded from view because of the vehicle's trajectory, which argues for the figures as maximum OTS.

The 36 fixed panel sites contained 63 panels, which signifies that a high proportion of the sites were multiple panel sites. Because of the adjacency of the panels, it is difficult to ascribe a given eye-gaze point as being solely aimed at a particular panel. Indeed it is possible that information from more than one panel may be picked up via a single gaze at some intermediate or closely proximate point. Therefore hit rates for this group of panels are not easy to estimate, or interpret. Two contrasting ways of estimating hit rates are to “share” the gazes at fixed panels over the number of panels per site, and to calculate the hit rate for the site as a whole. The “true” hit rate is arguably intermediate to these two values. Table 14 indicates the extent of the problem by listing the route information by the corresponding numbers of sites and numbers of panels. It remains, in the following section, to calculate the two sets of hit rate scores.

**Table 14:** *Numbers of fixed panel sites and number of panels*

Route	Format	N(sites)	N(panels)
Residential	Free-standing	6	11
	Bus-shelter	2	3
Arterial	Free-standing	4	11
	Bus-shelter	8	8
Shopping	Free-standing	4	4
	Bus-shelter	12	26
<b>Total</b>	<b>Free-standing</b>	<b>14</b>	<b>26</b>
	<b>Bus-shelter</b>	<b>22</b>	<b>37</b>

#### 5.4.1 Fixed panel hit rates: Aggregation

From the video analysis of the data, it was possible to derive the following results, for the various panel categories, and by aggregating over the participants in each condition (table row). Table 15 gives the raw data for the number of hits per panel condition, and the number of hits per subject in that condition. Table 16 converts these results into hit rate scores. It should be emphasised that these hit rates like those for buses are accumulated hit rates, corresponding to the full exposure of the participating driver or passenger over their own viewing interval. It will be evident that the sample sizes at the lowest level of aggregation are very small, so that extensive pooling should be used before beginning to interpret the results. Finally Figures 3 and 4 show the hit rates aggregated over the three routes, by panel and by site. These arguably are the most representative pictures of the fixed panel results, however, the reservations expressed previously in this section continue to apply.

**Table 15:** Hits and hit proportions/subject for fixed panels

	Format	N(hits)	N hits/subject
Residential (N=8)	Free-standing	28	3.50
	Bus-shelter	8	1.00
Arterial (N=9)	Free-standing	8	0.89
	Bus-shelter	15	1.67
Shopping (N=9)	Free-standing	18	2.00
	Bus-shelter	19	2.11
<b>Driver totals (N=26)</b>	<b>Free-standing</b>	<b>54</b>	<b>2.08</b>
	<b>Bus-shelter</b>	<b>42</b>	<b>1.62</b>

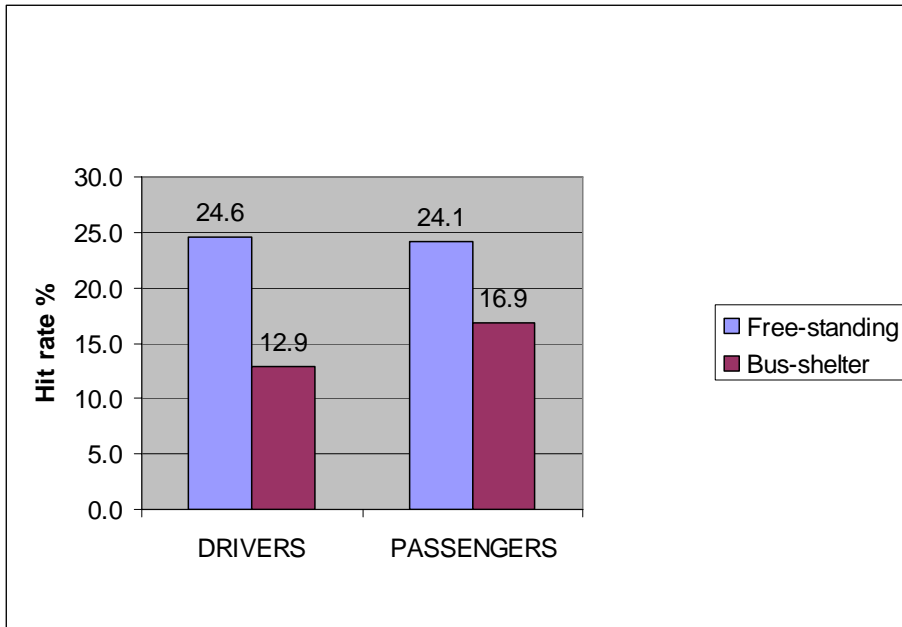
Residential (N=11)	Free-standing	36	3.27
	Bus-shelter	7	0.64
Arterial (N=6)	Free-standing	6	1.00
	Bus-shelter	13	2.17
Shopping (N=9)	Free-standing	18	2.00
	Bus-shelter	31	3.44
<b>Passenger totals (N=26)</b>	<b>Free-standing</b>	<b>60</b>	<b>2.31</b>
	<b>Bus-shelter</b>	<b>51</b>	<b>1.96</b>

Residential (N=19)	Free-standing	64	3.37
	Bus-shelter	15	0.79
Arterial (N=15)	Free-standing	13	0.87
	Bus-shelter	28	1.87
Shopping (N=18)	Free-standing	36	2.00
	Bus-shelter	50	2.78
<b>Aggregate totals (N=52)</b>	<b>Free-standing</b>	<b>113</b>	<b>2.17</b>
	<b>Bus-shelter</b>	<b>93</b>	<b>1.79</b>

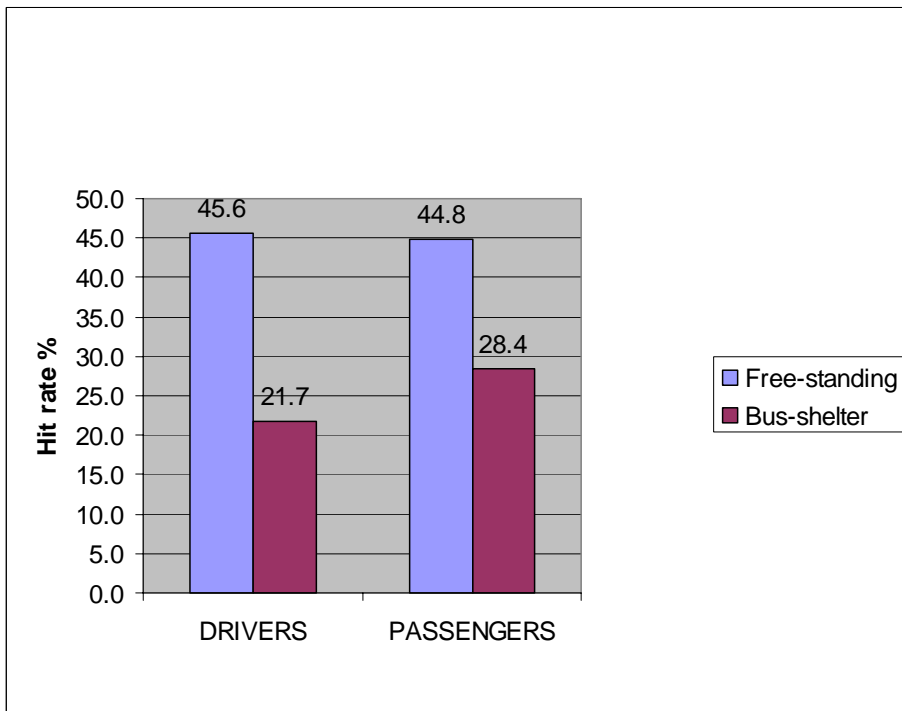
**Table 16:** Hit rates per site and per panel for fixed poster panels as a function of route and task (driver vs. passenger)

Area	Format	Drivers		Passengers		Aggregate	
		HR% (sites)	HR% (panels)	HR% (sites)	HR% (panels)	HR% (sites)	HR% (panels)
Residential	Free-standing	58.3	31.8	54.5	29.8	56.1	30.6
	Bus-shelter	50.0	33.3	31.8	21.2	39.5	26.3
Arterial	Free-standing	22.2	8.1	25.0	9.1	21.7	7.9
	Bus-shelter	20.8	20.8	27.1	27.1	23.3	23.3
Shopping	Free-standing	50.0	50.0	50.0	50.0	50.0	50.0
	Bus-shelter	17.6	8.1	28.7	13.2	23.1	10.7
<b>Total</b>	<b>Free-standing</b>	<b>45.6</b>	<b>24.6</b>	<b>44.8</b>	<b>24.1</b>	<b>44.5</b>	<b>24.0</b>
	<b>Bus-shelter</b>	<b>21.7</b>	<b>12.9</b>	<b>28.4</b>	<b>16.9</b>	<b>24.7</b>	<b>14.7</b>

**Figure 3:** Hit rate per panel for fixed panels aggregated over route (Residential/Arterial/Shopping): Drivers vs. Passengers



**Figure 4:** Hit rate per panel site for fixed panels aggregated over route (Residential/Arterial/Shopping): Drivers vs. Passengers



On the basis of these results, suitably aggregated, the hit rates for free-standing panels lie somewhere between 24% and 45%, and for bus-shelters between 15% and 25%.

#### 5.4.2 Fixed panel hit rates: Isolated solus panels

In a small number of cases there was a single panel in a sector and these were chosen for individual hit rate analysis to illustrate the range of hit rates achieved, and to provide some detail as to their environmental contexts. It is important to view the figures in relation to the environmental and traffic contexts for the individual cases. What in effect amounts to the corresponding exposure or OTS duration was obtained from the VCD record, and the values so obtained are included along with the individual hit rates.

On the Residential route there were two 48 sheets (in sectors 2 and 16) which were fixated (at least once) by 11 and 10 out of 19 observers respectively, corresponding to hit rates of 58% and 53% and exposure durations of 26.1 and 14.4 seconds. On the Arterial route there was one isolated bus-shelter (in sector a2) which was not fixated by any of the 15 observers, a hit rate of 0%, but the exposure duration was a mere 3.9 seconds. The Arterial bus-shelter was on a relatively high speed section of the route and would generally have been passed in traffic at about 40 mph. Indeed most panels on the Arterial Route were exposed for less than 5 seconds. On the Shopping route, there was a single 6 sheet (in sector s3) that was fixated by 15 out of 18 observers, corresponding to a hit rate of 83% and an exposure duration of 41.9 seconds; this was at a pedestrian crossing and the car was often stationary at this point in the journey. There were also two bus-shelters with posters (in sectors 5 and 9) that were fixated by 1 and 3 out of 18 observers, corresponding to hit rates of 6% and 17%, and exposure durations of 6.3 and 11.6 seconds respectively.

Other pertinent factors include road speed, pedestrian and road traffic density, and the local geometry (including the panel eccentricity). It should be noted that none of the panels were backlit.

The exposure durations for all panels in a sector were available from the analysis record. Only those reported above could be associated with their own individual hit rates and exposure durations<sup>4</sup>. This limitation was imposed by the facts of differing car trajectories and varying degrees of occlusion due to surrounding traffic – i.e., what was in the field of view of one observer was masked by other vehicles in the field of view of another. Occlusion was not such a problem that it reduced the numbers of potential observers for the single panels whose individual hit rates were given above. It is nonetheless instructive to see how much time a panel was potentially viewable in these circumstances. For the Shopping route (with 11 of its 15 sectors containing roadside panels of some sort), the exposure time for a panel averaged 20.51 seconds (range 14.5 - 56.0 seconds). Exposure time respectively for the Residential route sectors (8/18 sectors with panels) was 18.07 seconds (10.2 – 40.1 seconds) and for the Arterial route sectors (6/6 with panels) 5.35 seconds (3.9 – 8.8 seconds).

---

<sup>4</sup> A parallel analysis was not possible for panels on buses, which presented far greater problems for video analysis because of a bus might enter and leave the field of view several times, as well as often being difficult to identify as the same bus when it did so.

## 6. DISCUSSION

The first conclusion of this study is that the video recordings contained a vast amount of information, and the analysis of them was fully justified. The needle-haystack metaphor hardly applies since the results of the analysis are so complex; perhaps we end with an ordered collection of needles. It is important to put the outcome in context. The starting point was a set of VCD recordings of the eye movements of drivers and passengers, free to move their eyes as normal, in a vehicle that was mostly on the move, in a complex natural world populated by other people and traffic; and advertising posters on street poster panels and on buses. The degrees of freedom afforded to the visual systems of our participants were as vast as they could possibly be in the visually complex environments to which they were exposed, and this was reflected in the complexity of what they could (and did) examine. The amount of data reduction that has been achieved should not be underestimated, even if the final accumulation of reported data is substantial. One important end point is a set of estimated visibility hit rates. The impression is that they are lower than might be expected, and further study is needed to see how far they diverge from estimates from other methods. Although headline figures should be left to headline writers, some summary information should be extracted, and the list of caveats which have been distributed through this report should be repeated and indeed expanded.

As to the point that hit rate figures are lower than some may have expected, the following is an excerpt from a study in the BAT archive, which was made public in 2004:

*“The results of this study revise a number of anecdotally supported views about poster effectiveness. Notably, the proportion of posters actually viewed at all is surprisingly low (c. 15%) and actual unaided recall is even lower (c. 2%).”*

The BAT study was an early eye-tracking investigation to establish what car occupants looked at, with particular reference to outdoor advertising. The results of the present study indicate substantially higher scores for almost all formats. They do not bear on the question of recall, which one can reasonably expect to be considerably lower, as in the BAT study, and will not be discussed further in this report.

The fact that the source research was not specifically designed to support the complex analyses undertaken in the form of a video analysis should not be overlooked. Undoubtedly the technology for a properly targeted study would have provided better resolution, a wider field of view, and more convenient means for event logging. The ideal system, with automated tracking of objects viewed is still a far-distant possibility. Even so what has been achieved with the technology actually used is a considerable body of new knowledge and potential insights into poster panel viewing.

What else might be said regarding the limits of the original study as a source of evidence on what vehicle occupants look at with special reference to outdoor advertising? Clearly the environment could not by itself represent all the contexts in which advertising panels could be viewed by drivers/passengers, and this could even apply to the City of Nottingham itself. The detailed descriptions of the environment will enable other experts to judge whether it was so exceptional – and precisely in what way - that it could not be the basis for generalization. Time of day was varied and probably was not per se a problem for generalization, and this probably goes for day of week too, but time of year could be a limiting factor, at least in the view of a critic concerned with generalization. The original study had to be rescheduled from

its planned winter timetabling because of the height of the sun in the sky at certain times of the day proved to be a problem for the eye-track system and the study was conducted in March 2000 when the sun was at a height in the sky that did not interfere with data capture. The nature of the participants, wholly volunteers recruited by advertising in local newspapers, could be a source of concern, though counter-evidence would need to be provided that this biased the results in a particularly contrary direction. The list of potential criticisms is not quite endless, but it must be considered as a key framing context for the results themselves.

In its favour, the present study has the considerable advantage of not having announced its objectives to the participants, who simply had no idea that their eye movements would be analysed with respect to any advertising material that chanced to be in their view when they took part in the original study. It is hard to see that they could have known, since those involved in the source study would have had no idea either. This advantage extends to the naturalness of the behaviours of the participants who simply had to drive, as they normally would, along a designated route through their home city, for a modest payment.

The “true” hit rates estimated in this study should be obviously viewed with caution as emphasised throughout the report. What should also be underlined is that they are analogous not to the raw hit rates directly obtained via the laboratory-based eye-tracking method, but to the accumulated hit rate scores that are generated in the probabilistic Poststar visibility model, which are based on the raw hit rates. The raw hit rates are used to estimate the probability of seeing a poster in a momentary view at a distance from the poster, and they are used to derive an aggregate measure of the probability of seeing the poster in the course of an entire passage past the poster. The hit rates obtained in the present study are conceptually closer to these accumulated scores in that they constitute the probability of seeing the target in the entirety of an actual passage. Despite this important similarity, the hit rates as estimated above do reflect the degrading factor of obstructions to viewing (especially occlusion) produced by street architecture and intervening traffic.

An important warning that applies to all the summary measurements in this report, and particularly to the hit rate estimates, relates to the sample sizes on which the statistics are based. Clearly greater confidence, all else being equal, attaches to measures based on larger samples. Sample size requirements are otherwise none too clear in this novel research territory, and the properties of the measurements (including their reliability) are not known. The key hit rate scores reported in the report have been given along with relevant sample size information, of course, and this will be particularly important to users of the report in interpreting the findings. The approach taken in reporting the results was generally to require a combination of satisfactory numbers of observers and satisfactory numbers of encounters, more than 8 of each, before calculating hit rates, though in some instances this was marginal (e.g., Table 9).

Hit rates for bus posters were estimated as the proportion of gazes directed at buses with posters that were noted as being directed at the posters. Considered overall (aggregating over routes and pooling the data for drivers and passengers), the hit rate for buses encountered at road junctions was 20% (n=218 observations). The hit rate for buses viewed from behind was 46% overall, with some possibly substantial differences attributable to the combination of driver vs. passenger and single- vs. double-decker categories (see Table 13). For offside encounters with buses (approaching from the opposite direction), the overall hit rate was 37% (n=164) (again with a sizeable driver-passenger difference, see Table 11), while for buses on the nearside (i.e., being overtaken) the hit rate was just 6% (n=51); this is hardly a

surprise given the nature of the manoeuvre. The hit rate for free-standing roadside panels was between 24% and 45% (n=113) and for bus-shelters between 15% and 25% (n=93), with the full range of hit rates for individual panels.

The values summarized in the preceding concluding paragraph and elsewhere in the body of the report are subject to the many qualifications already expressed. It should be emphasised that the whole tenor of these qualifications has tended to be negative, and in this light it would be reasonable to conclude that hit rate levels have been somewhat underestimated. It is important to see too that method of enquiry is substantially vindicated, not so much by the absolute levels of visibility implied by the hit rate scores, but by the fact that the levels for different conditions are ordered in a reasonable and interpretable fashion; expectations as to what are the "best" and "worst" conditions are mostly confirmed. While there are some surprises, the study delivers a number of useful insights. In conclusion, it will be obvious that the method itself is very labour-intensive and in requiring highly specialized equipment and personnel, it would be very difficult to replicate; the advance of technology may change this but it is unlikely to be deliverable or affordable for some time in the immediate future.

## ACKNOWLEDGMENTS

1. Thanks are due to Praful Ghandi, Steve Newton and Sue Nicholas of the School of Psychology, Birkbeck College, for their work in transferring the video tapes to video CD format, and for helping to set up a dedicated workstation for video analysis.
2. The empirical research for DAS was done in 2000 by a partnership between the School of Psychology, Birkbeck College, under the supervision of PJB and the Department of Psychology, University of Nottingham, under the supervision of Professor Geoffrey Underwood. Thanks are due to Professor Underwood and Dr Peter Chapman, and especially to Hazel Dobson who was responsible for collecting and preparing the raw data for further analysis.

## REFERENCES

- CRUNDALL, D.E., and UNDERWOOD, G. (1998). Effects of experience and processing demands on visual information acquisition in drivers. *Ergonomics*. **41**, 448-458.
- DUCHOWSKI, A.T. (2002). A breadth-first survey of eye tracking applications. *Behaviour Research Methods, Instrumentation, and Computers*. ??, 1-16.
- DUCHOWSKI, A.T. (2003). *Eye Tracking Methodology. Theory and Practice*. Springer-Verlag: London.
- HENDERSON, J.M., and HOLLINGWORTH, A. (1998) Eye movements during scene viewing: An overview. In G. Underwood (Ed.), *Eye guidance in reading and scene perception* (p269-294). Oxford, UK: Elsevier
- LAWS, J.V. and BARBER, P.J. (1989) Video analysis in cognitive ergonomics: A methodological perspective. *Ergonomics*, **33**, 1303-1318.

## Appendix 1

### Operational description (driver actions) of routes used for the POSTAR Nottingham eye-tracking Study

#### Arterial route

- a1 left out of Wilford Lane along A60 to the pedestrian lights just before Trent Bridge
- a2 over Trent Bridge to traffic lights at junction with Meadow Lane and Trumans Road
- a3 straight ahead along London Road (A60) towards city centre to major junction with City Link and Canal Street
- a4 left into Canal Street (A6008) to major junction of Maid Marian Way, Castle Boulevard and Wilford Street
- a5 down Wilford Street and Wilford Road To Junction with Waterway Street West and Queen's Drive (A453)
- a6 straight ahead into Queen's Drive to flyover junction with Clifton Boulevard (A52)
- a7 leave A52 at Dunkirk roundabout and then drive back up to A52 by slip road from the roundabout

#### Residential route

- r1 Churchfield Road
- r2 left along Alfreton Road
- r3 right into Chadwick Road
- r4 veer right into Durley Road
- r5 left into Bobbers Mill Road
- r6 left into Radford Road
- r7 right into Beaconsfield Road
- r8 left into Cardwell Street
- r9 right into Gladstone Street
- r10 right into Foxall Road
- r11 left into Central Berridge Road East
- r12 right into Sherwood Rise
- r13 roundabout, right down Gregory Boulevard
- r14 left into Radford Road
- r15 right into Bentinck Road
- r16 straight ahead into first part of Hartley Road
- r17 across A6139 to second part Hartley Road and down St Peter's Street
- r18 right into Ilkeston Road

#### Shopping Route

- s1 Weekday Cross at junction with Middle Pavement to the bottom of Fletcher Gate (this appears not to be in some of the videos)
- s2 Junction of Fletcher Gate into Victoria Street and then to the end of Bridlesmith Gate
- s3 Junction of Bridlesmith Gate and Wheeler Gate to the end of Wheeler Gate
- s4 Junction of Wheeler Gate into Friar Lane
- s5 Roundabout at end of Friar Lane as it meets A6008, along A6008 to next roundabout (junction with the A610), all the way around the roundabout to traffic lights at start of return of A6008
- s6 Back down A6008 as far as the entrance to Mount Street
- s7 Into Mount Street to the junction with Angel Row
- s8 Into Angel Row to the junction with Market Street and Old Market Square
- s9 Into Market Street to the junction with Upper Parliament Street
- s10 Into Upper Parliament Street to roundabout with A6008 and A610 as far as the exit

- back down to Upper Parliament Street
- s11 Back down Upper Parliament Street to Theatre Royal junction (opposite mouth of Market Street)
- s12 Across complex junction to up South Sherwood Street to junction with Burton Street
- s13 Down Burton Street and Trinity Street to junction with Milton Street
- s14 Down Milton Street to junction with Lower Parliament Street
- s15 Down Lower Parliament Street to junction with Glasshouse Street

## Appendix 2

### ***Outline of Coding and Sample of coded output from The Observer***

#### 1. Outline of coding

##### Independent Variables:

Passenger/Driver  
Male/Female  
Drive number  
Arterial/Residential/Shopping

##### **Dependent variables/observations:**

###### For the static items:

How many bus shelters present in the scene (1,2,3,4 or more)  
Poster on item/Poster not on item  
Fixated on poster on a bus shelter  
Fixated on a shelter but not on any of its posters  
Fixated on a bus shelter with no poster

How many phone boxes present in scene (1,2,3,4 or more)  
Poster on item/Poster not on item  
Fixated on poster on a phone box  
Fixated on a phone box but not on any of its posters  
Fixated on a phone box with no poster

How many freestanding posters present in scene (1,2,3,4 or more)  
Poster on item/Poster not on item  
Fixated on freestanding space with a poster  
Fixated on a freestanding space but not on any of its posters  
NB Potential freestanding poster sites were not assessed

###### For the mobile items:

How many **single-decker buses** present in scene (1,2,3,4 or more)  
Poster on item/Poster not on item  
Fixated on poster on a single-decker  
    If so – low back panel  
            whole back  
            side panel low  
Fixated on a single-decker but not on any of its posters  
Fixated on a single-decker with no poster

How many **double-decker buses** present in scene (1,2,3,4 or more)

Poster on item/Poster not on item

Fixated on poster on a double-decker

If so –                    back top left    back top right

                                  front top left    front top right

                                  back panel low   back panel middle   back panel high

                                  side panel low    side panel middle

                                  side T    side rotated L

                                  whole back

Fixated on a double-decker but not on any of its posters

Fixated on a double-decker with no poster

NB Bus company names, logos etc. were not scored as posters. Tourist coaches were excluded (there were very few).

How many **taxis** present in scene (1,2,3,4 or more)

Poster on item/Poster not on item

Fixated on poster on a taxi

Fixated on a taxi but not on any of its posters

Fixated on a taxi with no poster

NB only classic black cabs were coded; and being rare in 2000, only the presence/absence of a poster was recorded.

Car behaviour:

Stopped ahead

Stopped right

Stopped left

Moving ahead

Moving right

Moving left

2. Sample of coded output from The Observer. The text written in red and blue illustrates the meaning of the coding. The numbers to the left, after (start), are times in seconds and milliseconds.

```

02-12-2004          date of coding
Driver             activity of the observer
Male              sex
26                drive number
Residential        nature of outdoor environment
{start}
0.00 gaze video break
0.00 single video bre
0.00 doubles video br
0.00 Taxi video bre
0.00 phone video brea
0.00 bs sh video bre
0.00 fre st video bre
0.00 car video break
                    these codes indicate that nothing is being
                    recorded - it is the start of the video, not
                    of the drives

81.40 other        looking at an item not of interest to this
study

81.40 s none      there are no single-deckers in field of view
81.40 d none      there are no double-deckers in field of view
81.40 t none      there are no taxis in field of view
81.40 f none      there are no f(ph)one boxes in field of view
                    (these negative codes initiate the codes for
                    the session)

81.40 bs one,no poster on ite
                    a single bus shelter is field of view with no
                    posters but it is NOT fixated

81.40 p none      there are no free standing posters in field
                    of view (every time a taxi (t), single
                    decker (s), double decker (d), phone box (f),
                    bus shelter (bs), free standing poster (p)
                    goes out of the potential field of view the
                    letter code followed by none is inserted)

81.40 moving ahead
                    the car is moving straight ahead
87.20 bs none     the bus shelter is out of the potential field
                    of view

118.00 s one,no poster on ite
                    a single decker with no posters is in the
                    potential field of view but it is NOT fixated

119.36 single no poster
                    the single decker that has no posters is
                    fixated
119.40 other      the driver fixated on an object that is not
                    if interest to to the study
119.50 single no poster
                    fixated on the no poster single decker (ie
                    when an item of interest is written in full
                    or capitals - BS (bus shelter) or PB (phone
                    box) - it is being fixated

119.63 other
119.90 single no poster
120.10 other
120.40 single no poster
120.80 other
120.86 single no poster
121.10 other
121.50 single no poster
121.60 other

```

121.73 single no poster  
 121.86 other  
 122.06 single no poster  
 122.30 other  
 122.46 single no poster  
 123.06 other  
 123.10 single no poster  
 123.36 other  
 123.60 single no poster  
 124.80 other  
 126.60 s none single decker no longer in potential field of view  
 129.86 bs one, no poster on item  
 156.73 BS no poster bus shelter fixated  
 156.86 other  
 157.43 single no poster single fixated  
 157.50 other  
 157.63 single no poster ditto  
 157.76 other  
 157.93 single no poster ditto  
 157.96 other  
 159.53 BS no poster ditto  
 159.63 other  
 164.93 s one, no poster on item single decker with no poster in potential field of view  
 165.20 bs none bus shelter out of potential field of view  
 168.66 bs one, no poster on item  
 176.13 BS no poster fixated  
 176.26 other  
 177.30 s none  
 179.20 moving left  
 179.20 p one, poster on item free standing poster in field of view  
 179.40 BS no poster fixated  
 179.46 other  
 182.50 moving ahead  
 182.53 Free standing fixated  
 182.63 other  
 182.93 Free standing  
 183.26 other  
 184.43 Free standing  
 184.60 other  
 193.03 Free standing  
 193.06 other  
 193.20 moving right  
 195.63 moving ahead  
 195.63 p none  
 195.63 bs none  
 234.03 stopped ahead  
 235.33 moving right  
 240.56 moving ahead  
 243.46 moving right  
 246.56 moving ahead  
 250.53 f one, no poster on item  
 252.50 stopped ahead  
 252.50 moving left  
 255.46 moving ahead  
 259.36 f none  
 289.20 f none, no poster on item  
 292.50 PB no poster fixated on phone box with no poster  
 292.70 other  
 298.33 PB no poster  
 312.36 other

319.53 stopped left  
319.56 f none  
363.96 moving left  
367.43 moving ahead  
369.30 stopped ahead  
375.90 moving right  
379.66 moving ahead  
405.06 moving left  
408.83 moving ahead  
431.96 stopped ahead  
439.83 moving right  
443.46 moving ahead  
540.33 t one, no poster on item [taxi with no poster](#)  
551.60 t none

## Appendix 3

### Detailed descriptions of routes as seen from the Nottingham 2000 videotapes

#### 1. Arterial Route

a1 Coding starts at traffic light junction of **Wilford Lane** and A69. In front, to left on opposite side of A69 road, a double fronted detached house.

Double yellow lines are on left hand side (LHS) of road, Car in LH lane. Bus route. Turn left onto **A69** (that goes over **Trent Bridge**) – START of drive. Four-lane road, it has a narrow central reservation with no railings or plants. Almost immediately on LHS there is a bus lay-by with a bus shelter that has no posters. On the right hand side (RHS) Edwardian 3 storey detached houses with no gardens but parking around them, LHS road sign circular warning no U turns and then road off to left followed by lay-by for bus stop with bus shelter that is clear – no ads. No central reservation for short spell.

Central island with bollards and road off to left after gap, central reservation. Houses to left set back with front gardens.

Road off to left just before pedestrian lights. Break in central reservation. Lights and then railings on central reservation. Can see cars joining other carriage way through railings. Railings stop. Wide road, still has large houses on RHS and trees and hedges on LHS.

Road sign on LHS indicating road straight ahead and road veering off to left. Some form of city sign/poster about a 6-sheet size in central reservation with a smaller white poster above, facing flow of traffic (not coded). Big houses ended on RHS. Still double yellow line and central reservation. On RHS, shop/restaurant? with striped blinds and parking. On road, large arrows indicate ahead and left. Road off to left with words in both lanes. RHS landscape low with tall buildings ahead in distance.

LHS is down to grass and trees. Road sign on LHS indicates three lanes ahead. Bus lay-by to left; bus shelter clear – no posters. Two lanes go straight on and one lane feeding to right. Central reservation has railings. On RHS quite large buildings look like church and offices. Arrows in each lane, straight ahead ones have CITY written under them. Lay-by area ends and no central reservation - open for cars to turn right.

Arrows for ahead in road and central reservation back with railings on approach to traffic lights. Direction signs under RH traffic light of the two left lanes. Trees on LH side. Ahead, on RH side, office buildings behind several traffic lights of the junction.

a2 Ahead and on left trees and grass. After traffic lights, road merges with another main road, Radcliffe Road, A6011. On RHS, traffic island with the grass and trees after merge, two lanes one way straight ahead. Take left hand lane. This is Trent Bridge itself. Trees and hedges to left and a glimpse of the arches of Trent Bridge. Railings on LHS at edge of pavement leading to pedestrian lights.

View straight ahead of tall white curved tower block (Civic Centre) and offices in front. Traffic island becomes central reservation. Railings on LHS and road curves to left.

Approach onto Bridge, incline up, three lanes in each direction. Words written in LH lane, BUSES AND TAXIS ONLY. Stay in LH lane. No landscape either side as on bridge.

On bridge, pillared sides, central reservation, very wide road. Move to centre lane of ongoing traffic halfway across. Ahead is a vista of tallish buildings. At end of bridge on LHS sign indicating three lanes followed by arrows and words on road. In centre lane labelled CITY and an ahead arrow.

Ahead to set of traffic light, straight ahead. Looks like a large Inn on LHS and other old buildings. In front of the black and white building there is a bus shelter with a poster facing the direction of travel. Continue straight, one lane peels off left two middle lanes go straight ahead. Central reservation with break and no entry sign.

a3 **London Road** (A60) ahead is tree lined and has a central reservation with youngish trees arrows ahead on road. RHS also treed. Double yellow lines (dyls)

Ahead arrows on road as approaching traffic lights. Still double yellow. Big junction with Cattle Market Road to the right. Trees stop, hedge on LHS ahead on LHS large white building – before it is a Texaco petrol station and then DYLS stop and shortly afterwards so does the central reservation.

Ahead are pedestrian lights and the four lane, two way London road is tree lined. Road off to left after lights and the DYLS start again. On LHS behind trees is a wall with the name of some works in capitals followed by other low factory units. Dense trees to LHS. Road continues quite a way up a gentle incline. Becomes three lanes with feeder lane to right and two straight ahead and this is indicated by arrows on the road. Still trees to the left and trees ended to the right.

Another set of ahead arrows on road as traffic feeds off right at traffic lights at top of incline.

After lights, trees on LHS stop and there are railings on the left hand pavement. After junction central traffic island that diminishes and stops. Still DYLS, road off to left,

Old brick terraced building that open on to street that start with a curve at the corner that has a green sign above the door on the corner. Traffic red No Entry sign to street by door. On RHS low wall with distant vista of City buildings. Followed shortly by another road off to left. Road wide with painted striped central section and has feeder lane for oncoming Cars that need to turn right. Terraced building still to left on street with business signs. Another road off to left and old business terrace continues.

Road narrows but still four lanes two each way. Pub on corner on LHS (red painted door) and ahead on opposite side of road is a bus shelter with a poster facing flow of traffic. Victorian buildings on left street side and trees in front of wall on RHS. One of the RH lanes is used by ongoing traffic so ongoing traffic can turn right, still terraced works buildings on LHS. London Road reverts back to the two two-lanes.

RHS now has no trees and just a low wall or low buildings. No City vista, too high. Road widens to three lanes as approach traffic lights at a large junction. Arrows in road indicate two lanes ahead and the RH one ahead and right turn. No left turn at junction.

Ahead on LHS across junction interesting Victorian building with curved corner and three storeys in red brick with arched windows that appears to be boarded up. View to RHS has city vista again. Yellow hatching in junction. After junction railings by pavement on LHS and road inclines up (possibly over railway).

Still four lanes, two way and double yellow lines. No buildings on R or L and no vistas. Ongoing lane widens to three lanes and sign on LHS pavement indicates all go ahead and the LH lane is also for LH turn. At back of pavement, railings with flowers at top. Appears as if metal stairs down to LHS just before lamppost that has sign pointing left for station, sign about Parking and Travel information and above that a no waiting red and blue sign. Railing become a brick wall as approach crest of bridge which when there gives a distant view of the City. Arrows in road showing three lanes ahead.

In LH lane, still DYLS and arrows show can go ahead or left. At traffic lights of a large junction. proceed straight ahead, very wide two way road two left hand lanes have arrow for left turn only and ahead only is in the middle of the road. Low business buildings on either side. On LH pavement [bus shelter with poster](#) facing flow of traffic. Traffic sign showing roundabout layout. Still in LH lane. Another road sign giving details of locations and directional arrows.

At roundabout entrance, in distance a huge building that looks like three office towers together and to their left a church tower. Low roundabout with grass and trees. Traffic lights. End of London Road drive.

a4 Into roundabout and on LHS [hoardings at back of pavement with two/three posters ?24/?48](#).

Take first exit left, **Canal Street**, road signs on central traffic island at entrance. Vista in front of tall buildings and the church tower rising above skyline. Canal Street is wide, two-way, 4 lane and has a single yellow line at start. To left are old houses/office buildings with a small shop that has a [bus shelter with a poster](#) facing the flow of the traffic in front. No vegetation around and to right is a long 1950s type 3 storey factory/office block followed by similar age low business premises. Central traffic bollards, road off to left and then [free standing large ?48 posters](#) at end of ?layby/road entrance. One is positioned by side road facing oncoming traffic. One is angled about 30 degrees to oncoming traffic followed by two slightly angled towards the traffic coming in the opposite direction. They are on a not built bit of land with little posts in front. There is a gap and then there is a [fifth poster](#) angled at about 45 degrees to oncoming traffic followed by a fifth that is parallel to the flow of traffic. Opposite them there is a Hire Centre with clear lettering above its ground floor.

Canal Street still wide and four lanes, two way and with same styles of buildings. On RHS small Carpark with tree in corner by pavement and opposite Car parked in bay on LHS behind which taller Victorian Works with opening on to pavement. Road off to left with ahead arrows in all three lane. At far side of turning, directional road signs in front of a clump of trees. Small business on RHS.

Canal Street splits. Ongoing traffic goes straight ahead, oncoming facing traffic feeds in from right from the other side of a large four storey Car park/office block/bus station that is now on RHS. On LHS row of trees and a set of pedestrian lights with rails on each side at the edge of the pavement. Canal Street now three lanes and one-way and increases to four lanes wide plus a bus lane on LHS. Car in middle lane. To left and ahead are tallish city buildings. Bus station/Car park to RHS.

On left is a route direction sign followed by directional arrows on the road with Road Numbers or Names. Car in middle lane labelled A6008. The RH lane is for buses entering the Station and three lanes go straight ahead. LH bus lane peels off to left and Car moves over left one lane. Road marking ahead arrow and A453 MI SOUTH.

Surrounding buildings still old but getting taller and now more of a shopping than business area. Across junction, railing on pavement edge on L and RHS. Pass museum on LHS followed by trees, further down on RHS is a large three storey Car park. Canal Street three lane and still one way.

Still in LH lane, road sign to left giving directions, lay-by to left. Tall Victorian buildings both sides. Another set of road signs to left. Up to large junction. Ahead a massive, redbrick building four storey V shaped building with point of V facing Car. Traffic island with bollards to right of the two LH lanes, RH lane peels off to right.

Straight ahead at traffic lights, railings on LH pavement and a road direction sign followed by arrows in road. Still in LH lane and arrows in it are for ahead and L, other lane for ahead. Short central reservations with railings on RHS. End of Canal Street.

a5 Car peels off L into **Wilford Street** that has older three-storey business buildings on RHS and taller ones on LHS. Straight road, two way, double yellow lines and with a slight incline as approach bridges over canal and main railway line respectively. Over white wrought iron canal bridge and as approach rail bridge LH lane becomes two lanes with its LH lane peeling off shown by arrows on road. Stay in centre lane and approach traffic lights. Ahead on RHS is a modern circular building with something like a lookout gallery on top and bushes? around at street level.

Up walled approach to crest of the bridge; over crest on LHS is a road direction sign. On LHS are [two hoardings 24? sheet](#) at back of pavement and parallel to traffic. As bridge ends, appear to be an orange cycle lane on LHS and on far RHS. Road two lane in both directions and as approach traffic light both lanes have arrows for straight ahead. To the left there is a slip road over the cycle track with traffic lights (think it is Traffic St that is a cul de sac ).

Road crossing junction at lights is a busy road and bus route and I think a junction of 5 roads. Vista ahead is off low buildings, open space and some trees.

a6 Car proceeds into **Queen's Drive** ahead and past feeder road from left. Cycle lane still there and road ahead had mature bushy trees on either side. Central reservation to right that tapers out, cycle lane stops and now double yellow lines. Wide, four lane road, two lanes in each direction. Just after 40 mph sign, on LH side, is a bus stop with poster facing flow of traffic, cannot tell if ads at back. Fast main road.

Road to right into industrial estate followed by a set of pedestrian lights beyond which there is a bus stop but no shelter. Road markings for two LH lanes ahead arrows and third one for right turn into estate and again as come up to road directions on LHS and traffic lights. Road very wide, three lanes in each direction at the lights. Proceed ahead in LH lane.

Shortly after warning triangle on LHS on lamppost in grass verge, arrows on road indicating a right turning lane marked out on road for ongoing traffic. Straight on and round bend to a set of pedestrian lights, followed by a bus shelter with poster facing flow of traffic. Road still wide and mature tree lined and straight and has four lanes.

Little road off to right, mouth indicated by central traffic island and bollards and to left is a direction sign. Shortly after, arrows in road indicating ahead and that there is a road to the right. After that major arrows in road indicating a third LH lane for right turning traffic.

Before central reservation starts, road is arrowed off to the right and the two LH lanes are arrowed ahead with the most LH to the left as well. Central reservation between ahead and right turning traffic. Up to traffic light, car is in LH lane but proceeds ahead. After lights, traffic island between LH feeder road and Queen's Drive that has a bus shelter with a poster facing flow of traffic. Behind feeder road is a Wickes Store with its car-park and grassed surround followed by arrows on the road indicating ahead for both LH lanes and also a left turn for the kerbside lane. Central reservation finished. Traffic island starts before to traffic lights and railings. Big road to left.

No central reservation and car continues along Queen's Drive that is still grassy and has trees. On LHS pavement set back and has railings on none road side as it skirts Trent River's bank. Railings also start on roadside to left and at end sign with road directions. Central traffic bollards then third land marked out in centre for right turn. Bus stop on LHS but no shelter. Low modern industrial estate on RHS.

Shortly road widens to three lanes with arrows on road. On LHS are steps down from the road (?to river?) Traffic lights ahead both ordinary height and one high above LH lanes – third lane for right access – this is reflected in the road arrow markings. Road direction sign on LHS. Car continues straight ahead. After lights, bus shelter on LH side with poster facing flow of traffic. Countryside opened out and fewer trees

Central island with bollards.

Group of pylons and transformers on RHS.

Warning triangle of junction on LHS. Sign on LHS with road directions. Arrows on road LH lane for ahead and L inner LH lane arrow for ahead and words – could not read.

Arrows repeated and inner LH lane had AHEAD ONLY written before ahead arrow.

Slip road to left to Park and Ride with traffic direction of lamppost on far side of slip road. Traffic light for junction. Car went straight on.

Green countryside and few trees, as before. Road still four lane, two way and wide, central reservation after traffic lights that continues – ahead arrows on road. A one way road is running parallel and in same direction is on LHS. Car moves to right (inner) left hand lane. Both these ongoing roads come to traffic lights. Ahead to left is a huge road direction sign with plan of flyover and roundabout ahead. Can see the elevated section ahead that has only facing oncoming traffic on it. END OF QUEEN'S DRIVE

Car takes lane closest to elevated section ahead it has a right arrow on the road. There are two lanes to the left. Car stays in this lane to the roundabout that is under the flyover. No buildings around, just grass and shrubs and the usual safety barriers.

Car goes three quarters of the way round and on the LHS on the way up to the elevated section is a bus shelter with no poster. On slip road to that it narrows from two to one lane with arrow on road indicating that. Still shrubs and grass. The lane does not have to merge with the traffic as has its own path and a gantry above has road information.

Car moves into the centre of the three lane road that resembles a motorway with central crash barriers. Arrows in road with on the LH lane CITY and in the two lanes by the central reservation RING ROAD. This is the **Clifton Boulevard**. Ahead is a pedestrian bridge over all the roads with a road directions sign just before it and a bus shelter with no poster on LHS.

There is a slip road off to the left with a direction sign on its far side and then a slip road joining from the left. A gantry over the road gives road information for the left hand lane and for the two inner one. Car continues in middle lane and the gantry sign labels it as to the North (M1), Derby and Mansfield. This is followed by road arrows with RING ROAD on the two inner lanes and on outer CITY.

Car continues in middle lane to next road direction sign and road arrows and then moves over to the LH lane. Drives next to safety barrier to LHS Still no buildings – very open few trees.

a7 In lane with LH exit arrow, 40 speed limit. Road slopes down slightly and have a view of buildings in front in distance and of houses to LHS below level of the road. On LHD warning triangle with roundabout sign. This is the **Dunkirk Roundabout**. Two lane road down. Car stays in LH lane. Elevated section to the right.

On LH side road sign explaining the roundabout followed by 30 speed limit. Slip road widens to three lanes and driver takes centre lane. LH lane has a L arrow, middle has ahead and L arrow and RH lane ahead and R arrow. Car enters roundabout and takes out of two lanes around and leaves by the second exit taking the LH lane, through pedestrian crossing lights and up towards the elevated section.

\*\*\* End of Arterial Route \*\*\*

## **2. Residential Route**

r1 At the start of **Churchfield Lane** before the drive starts there is, on the right hand side set of old wooden gates and, just after, bollards in the middle of the road with warning triangle signs that there are humps ahead. There are humps either side of these bollards. The drive starts just after these humps. On the right hand side is a [bus shelter with no poster](#).

On the left hand side there is a stone wall with trees and a hedge and on the right hand side there is the long wall of a builders yard, Churchfield Lane is straight and has a slight incline.

It is a two way road with no yellow lines. At the next set of humps, the road narrows slightly and black posts put in at the edge of the road on each side. Just after these humps there is the main entrance into the builders yard. The road continues straight ahead with the RHS wall continuing into the distance. On the LHS there is an arched entrance in the wall and it ends at the corner of Grimston Road.

On LHS there is a terrace of Victorian houses opening on to the street and a no waiting sign with short yellow lines; on RHS is the builder's wall. At end of yellow lines there are two more humps with black posts on the roadside. Houses on LHS now 1930s with small front gardens and walls and gates. Cars can park in front on in designated areas. RHS housing also 1930s beginning.

Road to right then almost immediately one to left. All medium to high density housing. Road still on incline, bollards and stripped pole with light on top in middle of road with humps on each side. Yellow lines beside humps – same type of housing either side.

On LHS is a road to right with what looks like a shop or an ex-shop on the corner - this road has terraced houses with gable end to Churchfield Lane. Houses on left continue to be 1930s type. Ch. Lane levels out. Road to left followed by humps with posts at side of the road. Road to right, again terraced with gable end to Churchfield Lane. All along Ch. La. are parking areas and stretches of double yellow lines.

Road to left followed by humps but post on side of road to left missing, higher wall and tree behind it to LHS. Road to right, again same type of terrace. Signs indicating end of parking restrictions.

Properties on both sides of Ch La 1930s terrace with front gardens. Another set of humps with posts on either side of road. View of junction ahead and also of a very

tall white couple of buildings ahead to the left. Before junction ahead after houses some trees to the right.

Where double yellow line start bollards in middle of the road, blue keep left arrow on post and humps in each lane. Road entering from left next to junction with main road (Alfreton Road A160). On the right hand side on the corner is a bus shelter with no poster. Dotted lines to A160, bollards in middle of road.

r2 Opposite row of houses – 1930s semis close together with gardens in front. On the otherside of Alfreton Road, to the left on corner of Chadwick Road, is a bus shelter with no poster.

Left into **Alfreton Road** – main road and bus route, two lanes each way, bollards and white hatching in middle, houses either side. Almost immediately, take centre lane and wait to turn right into Chadwick Road. Just in front are bollards in middle of road and much further down the road on the right hand side is a main road that feeds traffic into Alfreton Road. At its exit, on its LHS is a 48? sheet free standing poster facing the car. In the distance, Alfreton Rd goes uphill and has trees on the RHS.

r3 Right into **Chadwick Road** that goes uphill with no yellow lines, two way, narrow. It is not a bus route. Terraced early 30s housing with small front gardens – cars parked half on pavement and half on road – no humps, no side streets. At top of road junction have 1950s detached houses facing with front gardens.

r4 It is Y junction and car turns right into Durley Road and continues uphill to a crossroads with modern housing opposite and a sign at the left of the junction for humps. Halt to check. Letter box on RH corner. On the opposite side of the Bobbers Mill Road, under some trees is a telephone box with no poster.

r5 Car turns left into the top half of **Bobbers Mill Road**. It is a straight road and not a bus route On right hand side are newish houses with grass and tree landscaping in front. This continues a considerable way on RHS. The road has sleeping policemen (called sleepers) rather than humps and these are not indicated by central bollards or side posts on the pavement edge.

Bobbers is a mainer two way road with parking bays or pavement parking on both sides. Houses are set further back and those on LHS are 1930's with larger front gardens. First sleeper is shortly after the junction followed by another just before road off to right. Just after that road the newer housing comes to an end and there is terraced housing that opens on to the road.

There is a sleeper before a road to the left that has a chapel/church on the far corner with some mature trees. The road is straight and the church grounds continue to the next sleeper where there is a warning triangle for a school on the left hand side. There is what looks like a school entrance on the RHS and the buildings look modern and are red brick. There are no houses on RHS after the church but there is a road to the left followed by some trees.

Ahead is a view of the T junction with Radford Road. There is a sleeper and then a white building to the right with an entrance to its car park from Bobber Mill and to the left a stone wall with a mature tree behind it. On the right hand corner at the end of Bobbers Mill Road there is a [telephone box with no poster](#).

r6 Across **Radford Road**, which is busy, two way bus route, is Granby Motors with a display of three windows and a blue and white sign. Car turns left and takes position to turn immediately right into Beaconsfield Street. Radford Road has zig-zags before traffic lights down to the left and a row of small shops on RHS.

r7 Car turns into narrow, two way Beaconsfield Street that is not a bus route. There is a sign on the left hand side notifying of humps. Chapel on LHS and then older type of terrace – Victorian three storey opening out onto tiny front garden on LHS and opposite look like modern ones on RHS. Straight road again, two way traffic. Cars parked either side at start and less densely further in. Not humps but sleepers with warning sign before first one. Victorian primary school on the right and car turns left into Cardwell Street.

r8 In **Cardwell Street** is a wider, two-way road and not a bus route' It is short and has no road marking and no humps. There are hedges on RHS with trees and a large modern looking building set back. Road goes uphill. On LHS grey and brick back walls and up at top of hill the back part of a tall terraced House and in the distance a spire Road off to left, hedge to right followed by wire fencing. Big church on left after road. Zig Zag marking on RHS road. Looks as if it is an entrance to a park behind the fence. After church, road goes downhill with road to left with terraced houses down it, back alley off to left. Fence continues on RHS to corner of junction with Gladstone Street.

View straight ahead to T junction and then beyond road a large tree obscuring a large, distant building behind it. Down to junction with Gladstone Street and there are warning signs that there are humps in both directions along it. Opposite to junction more fenced land with trees and grass.

r9 Turn right into **Gladstone Street** fencing either side with grass and trees behind. It is straight, two way road that is not a bus route and with few road markings. It has sleeper with warning flashes and stripe at each kerb-side. Green on LHS ends on the left and then large brick building, no windows (map says it is baths) clump of trees on LHS in front of it. Park ends on RHS. Big zig-zags on LHS. Road starts to go up hill and buildings (not houses) either side to next sleeper.

Road to right of terraced houses, gable end to Gladstone Street. Seems to be a car park on LHS with no access to Gladstone Street for vehicles (circular warning sign) and trees before a Victorian type warehouse. Entrance to back alley on RHS. Another road to RHS – has terrace of larger houses with small fronts. On LHS terrace of Victorian houses that open on to the street. On RHS looks like backs of buildings up to next sleeper. Road to right that has terraced houses with small fronts and gates. Road continues up hill. On left hand side looks like a shop, pub or ... with a car park and two entrances. On right hand side seems to be back walls of houses, gates and garage doors.

Sleeper before very large ?warehouse (Victorian) on LHS at crest of hill. Road off to RHS that seems to have larger houses. On RHS older square houses entrances down the side road. LHS superb redbrick factory/warehouse. Road continues straight up, no yellow lines with housing to RHS down side streets. Warning triangle that road narrows. Sleeper and then end of LHS factory, road to left and then large white House on LHS. Road to right on its far corner House/church with spire effect. Sleeper as a platform and foot path on top and posts at street side. On LHS matching white 3 storey terrace. On RHS looks like railings and a church. Road now level and on LHS three story terrace and on RHS gable ends of streets of terraced houses off to the right.

On LHS curious houses that open onto the street with balconies and have three storeys. On RHS look like old workshops with offices above that opened on to the street. Road off to the right with terraced house. At LHS work units and fence followed by more tall terraced houses. Sleeper in road and gable end of terrace on RHS. Road to right of terraced houses.

LHS 1950s two storey houses with small front gardens, RHS Victorian short terraces facing road – small fronts. LHS set of lock up garages. Road off to right with what looks like an old corner shop. Stone wall on LHS with mature trees overhanging and a FOR SALE notice on the wall gateway in wall. Trees in both LH and RH pavements. At end of wall, flat top sleeper.

On LHS three storey terrace, RHS sides of terraced houses and road to right of terraced houses. Low stone wall to LHS with gateway, similar on RHS followed by tree in pavement. Two telephone boxes with no posters on LHS (no ads) and a give way sign. Houses on RHS. Sleeper before road junction. Road still straight.

r10 Turn right, by corner shop on LHS in **Foxall Road** that goes downhill, is straight, two way, none bus route. It has two storey Victorian terraced houses that open onto the street. Tree in pavement on RHS. On RHS white/yellow line on edge of road in front of what looks like an entrance into ??? Just before junction, flat top sleeper with posts inset at pavement sides.

r11 Turn left into **Berridge Road East** that has a shuttered corner shop on LHS. This road is also straight, two way and with larger terraced houses on LHS that open onto the street. It has white dash marking down middle of the road. There is a bus stop on LHS. Straight over road junction with Wiverton Road that has a boarded up house on far RH corner. Alley off to the right followed by two ‘infill’ 1950’s semis with front gardens. RHS Terraced houses larger – three storey and small front spaces. Large flat top sleeper with posts at pavement side and road to right. Road off to right and LHS houses lower and more shrubs in fronts. Stone wall to left with creeper over the top. Large flat topped sleeper and sight of main road junction ahead with large mature trees on opposite side of junction. On both RH and LH corners of junction are very much larger houses. Double yellow lines (DYLS) at mouth of junction on both sides.

Very large house opposite T junction with Sherwood Rise (B682). Looking left up this road there is a cul de sac with mature trees and large houses set back behind

walls. Road marking zig zags prior to zebra crossing that is just ahead as exit when car turns right.

r12 Turn right into **Sherwood Rise** that is a fairly straight, two way, main road and bus route with walls and mature trees on either side and large houses many with gardens. Immediately after zebra crossing is a bus shelter with no poster on the left hand side and road off to right. Double yellow lines on LHS Road, off to left a detached house set back. Trees to right, then road off to right on corner huge house with gable end to road followed by long wall with large trees behind. LHS has houses set back, low wall and few trees. Road off to left with quite large house on corner with no trees in front. Road off to right, more tallish walls with trees behind. On both sides walls with trees behind and gates or drive entrances. Petrol Station on LHS, road direction sign in front of its low white picket fence. Road off to right opposite. LHS lock up white garage after petrol station. RHS high walls with trees behind. Still double yellow lines, bus shelter with no poster on LHS under trees and shelter (back and top only).

Major junction with large roundabout ahead with zebra crossing before traffic comes in from the right. RH pavement widens, railings on road edge and traffic island with bollards linking two parts of zebra. Road markings after zebra by stop line. LH lane straight on and left RH lane straight on and right. View ahead is of the roads and a backdrop of mature trees. Take the RH lane.

r13 Roundabout to right, flat with grass and flowers in the centre. Round the roundabout and out 270 degrees and enter **Gregory Boulevard** (A6130). This is a straight, two way main road that is a bus route. On LHS is the Forest Recreation Ground and the Boulevard is lined with mature trees at the road side and grass expanses. As enter, the Boulevard there is a central traffic island with bollards, road sign on RHS in shade and on RHS is a large church followed by a large white Edwardian type building that looks as if it is a hotel with parking in front and a bus shelter with a poster facing flow of traffic. Warning sign of people crossing. Double yellow lines on LH side stop. Mature trees on road edge on LHS and RHS

Double yellow lines on LH start, central bollards, exit to left with sign at entrance (prob. to bowling and cricket facilities). DLYS end. Long wall on RHS trees both sides. Pedestrian lights followed by road/drive off to right. Under trees, a bus shelter with poster facing flow of traffic on LHS and then road off to the right. On LHS a gap in the trees and a vista of the green grounds. On RHS long stone wall with trees in pavement again and trees on LHS.

DYLS and traffic bollards in centre of the road are followed by road off to the right and then DYLS end. Bus shelter with poster facing flow of traffic is on RHS under trees.

Railings by road on RHS and LHS and footbridge over road with circular height information sign on LHS just before it. Gap in trees on LHS and can see across the green.

DYLS start and bollards in middle of road followed by white cross stripes in middle of road and on RHS traffic sign pointing to a huge Park and Ride car park with entrance just before a modern-ish 2 storey box building that looks like offices in the car park

near to the wall by the pavement. After entrance to hide the buildings parallel with road are [4 free standing posters with ?24/?48 sheet](#) ads on hoardings.

By next road to the right there are two phone boxes with no posters set back under trees.

DYLS start again, bollards in centre of road and a yellow information sign on LHS lamppost on pavement in line with bollards. White slanting lines beyond bollards DYLS end. Exit from car park – no trees by exit.

Still trees on both sides of the road. Road off to right, large house on far corner. Pedestrian lights, road work, road narrows sign on pavement edge LHS. Blue arrow sign and cones in centre of road at base of pedestrian lights that are followed by yellow road works warning sign on LHS. Still trees in pavements, road off to RHS followed by row of houses set back with gardens in front.

DYLS and LH lane has two option, ahead and left of ahead and right. Red roadworks sign on LHS at pavement level saying when red light wait here. On lamppost behind, small yellow sign with arrow. Cones on RH side of road and barriers up in road – still trees overhanging. End of the trees and green into street with houses and shops. DYLS road works in right hand lane, traffic lights hooded out, road off to left and large Edwardian house on far corner and church on RHS of road. In some other runs the roadworks are in the other lane.

Road works still in RH lane and fenced off. Largish terraced houses on LHS with small gardens in front, DYLS and mature trees in pavement. End of roadworks in RH side. DYLS end.

Yellow advisory sign with arrows to L and R on lamppost followed by two huge trees either side of road. Terraced houses both sides of road. DYLS start – arrow options in road for L and ahead or ahead and R. On LHS what looks like a small factory unit. LH side of road widens to three lanes, take LH lane to traffic lights at junction with Radford Road. View ahead of terraced houses L and R.

r14 Turn into **Radford Road**, on far corner as turn a [?48/96 sheet hoarding](#) ad. and as turn into Road another [48/96 sheet](#) at 60ish degrees to it, on the side of a building. DYLS and shops to LHS. Radford Road is straight, two way and narrowish with three storey terraces either side with shop windows at street level. It is a bus route with DYLS and bus stop. Road off to left. Followed by zebra crossing with traffic bollards in middle and stripey pole. Road off to left and to right. Single yellow line to LHS and parking allowed. Still terraced with shops.

Road off to left and to right. Parking allowed to left. Road off to left and to right. Fewer shops more terraced houses opening on to street. Bus stop. Road off to right.

DYLS road arrows ahead, LH lane ahead or left, middle turn right. Road off left before traffic lights and Y junction ahead.

r15 Take the right hand arm into **Bentinck Road**, white shop on junction corner called BYED Co. The road is straight, two way, a bus route and goes uphill and has DLYs on LHS. LHS mixed houses with small front gardens; terraced houses on RHS opening onto street.

Near top of rise School warning triangle on LHS – on RHS shops. Road off to left with a wall round each corner with mature trees behind. On RHS is a bus shelter with no poster View ahead over crest of hill of very tall modern concrete looking buildings. Bus stop on LHS. Road arrow options in two lanes: ahead and left or ahead and right. Road to left before traffic light. Tall Victorian School on RHS. Large cream pub with sign on LHS by traffic lights.

r16 On crest of hill, go straight over Alfreton Road (A610) and into **Hartley Road**. Road now much wider, straight, two way and a bus route. RHS is a grassy patch. Full view ahead of concrete tall block, on LHS wide pavement, another road off to left and pink building with shop at street level. Single yellow line. Downhill to road off to right and on LHS small park. RHS corner shop that is part of 3 storey Victorian terrace houses that open on to street.

Near end of park, can park on LHS. At end of park on LHS, road off to left with pub on far corner. After pub lands of the tower block begin on LHS low wall with hedge. Tower black set back. On RHS terrace continues round gentle bend to right. Road off to right. Wide road, parking on LHS. Victorian terraced houses on RHS.

Wide road off to left and one to the right. RHS old terraced houses and on LHS modern terrace set back with planting in front. Road off to right and then more terrace. Pedestrian lights and modern housing on LHS ends. Road off to right and then a large concrete windowless structure with 48? sheet poster on side and other sign, looks like cinema or bingo hall or .... To LHS tall terraced, old houses. Road off to left followed by low terrace of shops (again old). Opposite, a road off to right by hall followed by 3 storey terrace of shops and houses. Double yellow lines on LHS. Letter box on LHS.

Ahead to traffic lights and very large redbrick Victorian Building across main road (Radford Boulevard) on LH corner. On RH corner opposite modern warehouse/factory unit, single storey with low pitched roof.

r17 Straight across Bradford Boulevard into the continuation of **Hartley Road**, alongside the tall Victorian and low modern building on left and right respectively. DYLs on LH side, road is two way and slopes down gently and fairly straight. Road off to left followed by terraced housing while RHS there is still the wall and low unit. It goes slightly down hill and is straight, two way and it appears not to be a bus route.

Road off to left followed by more old terraced housing. Wall to low level unit ends. Wide mouth of road off to right and on far corner is lynch gate surrounded by trees and long stone wall down hill along churchyard with mature trees and hedge behind. Opposite, after a terrace on LHS, low wall with shrubs. Church wall ends and house set back behind hedge on RHS and old stone buildings on LHS. Warning sign of

bend to the left on LHS. Road off to the right. On LHS various sheds and other buildings.

Traffic bollards in middle of road before the bend. Arrow in road indicates can go ahead or turn right towards what looks like the start of an industrial estate. Wide road to right

Road veers round to the left and is now level, two way, and apparently not a bus route and is called **St Peter's Street**. This road is not straight and curves gently from left to right. Terrace houses to left and then a factory side. Industrial estate to the right. No DYLS. Road off to left up to houses set back up to a bank. School warning sign on LHS. Wall on LHS. SLOW written in LH lane. Road off to left of terraced houses. Road off to right at end of wall. Traffic bollards in middle of the road and then road off to left.

Low wall to right with trees behind, still no yellow lines – think it is a parade of shops with car park. Opposite on LHS is a small car park with trees either side of entrance and poster on wall behind far one and then a white Building on corner with a long sign that says restaurant before grass patch and road off to left. Trees and low wall still to right.

Houses to left and white office building to right. On left very wide entrance to road at left, few houses and a row of trees and another road off to the left. Right side industrial units and a Renault car sales lot with cars parked on RH side of road.

Major road junction with arrows in road indicating straight ahead and left or right leading up to traffic lights at junction with Ilkeston Road (A609), that is a major through route and a bus route. Take RH lane. Across the road on RH corner are two free standing posters 24? sheet and 48? sheet free standing on hoardings in front of trees.

r18 There is a third free standing poster (48? sheet) on a hoarding on LHS as turn right into **Ilkeston Road**.

Ilkeston Road is a main road with two lanes each way DYLS.

\*\*\* End of Residential route \*\*\*

### **3. Shopping Route**

Approach shopping area from around the Broad Marsh Shopping Centre under twin pedestrian bridges and a left hand bend down into Middle Hill.

s1 All drives started at the junction of **Middle Pavement and Fletcher Gate** - two way traffic and a bus route. On left, in Middle Gate, stone arches as shop windows at 90 degrees and paved space in front to direction of travel and just in front. Pedestrian crossing at start of Weekday Street was the starting point.

Few trees on left hand side further down on right, car parking in right hand side (RHS) of road. Bus stop on LHS but no shelter.

Start of Fletcher Gate, bollards in middle of road, large car park ahead on RHS, no parking on RHS of road, but parking on left hand side (LHS). Side road up side of car park with large shop windows on ground floor. After car park, road is one way and still a bus route.

Cars parked on both sides of the road, more trees on RHS. LHS Victorian 3 storey buildings, straight road and ahead many trees left and right

Car parking stops RHS, double yellow lines (DYLS). Can see trees on traffic island ahead. Car parking stops LHS - DYLS

Y junction with treed island ahead with Warser Gate feeding in from right (one way).

s2 Follow LH bend into Victoria Street (one way), also a bus route. View on bend just after trees on traffic island into pedestrianised shopping area. Old buildings of 3/4 storeys, one with two tiers of white arches.

Approach Victoria Street – NO ENTRY written on road, no right turn road sign. In front three storey shop front – sandstone floor to ceiling rectangular shop windows and above red brick with large white arched windows on top 2 floors.

As turn left into **Victoria Street** (one way) on RHS two, turquoise green shut doors, a bright green sign above an arched entrance and a double fronted shop with dark green paint and rounded blinds. This too is a bus route.

Victoria St slopes down and as enter have vista of shops on each side and of buildings far ahead further down the gentle hill. On RHS DYLS at first and then cars parked further down the road. Varied old buildings 3 to 4 storeys high. Car parking down LHS street.

Further down on RHS yellow skip and on LHS building with scaffolding and blue tarpaulins

Car parking on LHS all way down. Road marking with arrow and TURN LEFT. Before left turn, view straight ahead of pedestrianised shopping street (the Poultry) and a pedestrian crossing at its mouth and of buildings in distance.

As turn into **Bridlesmith's Gate** (one way) on RHS [6 sheet free standing poster](#) but not angled so cannot be seen from this direction. This is one way and not a bus route

Similar 3 to 4 storey old buildings with red-brick, stone with arched shop windows some have flowers on 1<sup>st</sup> floor. Lamp-post has flowers high. DYLS on RHS and LHS. Ahead is a pedestrian crossing and view of a tall black and white timbered building. ON LH Lamppost, high flowers with traffic sign underneath. Straight ahead on bend to right into St Peter's Gate, by the black and white building, is a shop with a long green shop front called Kelly with a [freestanding six sheet poster](#) face on to the flow of traffic. Just before that bend there is a zebra with a view up another shopping street (rest of Bridlesmith Gate).

Turn 90 degrees into **St Peter's Gate**. St Peter's Gate (one way and not a bus route) also slopes down and has shops on either side, at start buildings less grand but same height. Parking in RHS after the bend and further down on LHS. About half way down on RHS formal Portland stone Victorian Office type buildings. On LHS trees. Car parking both sides. By second office on RHS car parking stops. View ahead of trees and some open space. LHS parking and trees RHS shops again.

At bottom pavement widens and there is open space with view of a building with white frieze and long pairs of white windows. Road narrows to pedestrian crossing. Trees ahead - shops set further back on RHS – waste bins either side of zebra crossing and a black pedestrian signpost. On RHS in front of Mac is a free-standing 6 sheet poster at 60 degrees to the road and beyond that on RHS are two phone boxes with no posters, with a tree nearby. Under tree is a circular wall where people sit. There is a road off to left (Hounds Gate).

s3 Veer right up **Wheeler Gate** – one way and not a bus route- DYLS on RHS – trees and parked cars on LHS – wider street building societies and shops on RHS, LHS hard to see as cars parked – look like modern offices with some shops beneath. Regular waste bins on RHS pavement. Halfway up on LHS there are two phone boxes without posters. It is quite a long street. At top, no parking and on a traffic island to RHS looking towards Old Market Square there is a free standing 6 sheet poster set back. Over zebra crossing as road veers left.

s4 Ahead to the right have view of **Old Market Square** that has trees junction of South Parade from right (a bus route) and Beast Market Hill straight ahead – very open junction with buses coming from many directions. One way sign straight ahead in front of Burton's shop windows. No trees and two-way traffic as enter Friar Lane, a major bus route. Railings on pavement edge at junction.

**Friar Lane** is a wide uphill street with shops either side and single and double decker buses, grey Portland stone 3 story buildings (1930's?). Some parking on RHS. Half way up tall wide block on RHS – ahead of view to end of Friar Lane with what looks like a four pillared classical building. Traffic islands with bollards in front of the big building that has shops underneath. On the LHS in the lower part of there are three bus shelters without posters.

s5 At top of street, traffic island with bollards and main road signage in front of a large roundabout with flowers on railings all round it. Junction of **Maid Marian Way (A6008)** major through and bus route. All round are tall modern office blocks – take third exit (270 degrees) down A6008.

Road signs at entrance to Maid Marian Way and some cones. Dual carriageway - central reservation with mature shrubs and some trees, tall office blocks on either side. DYLS on LHS and some shops and odd trees. Driving in RH lane. Zebra crossing just after St James St to left that looks pedestrianised. Continue in RH lane. To left shops and a bus shelter with poster on end panel facing flow of traffic. Road to left, tree on each corner. The LH pavement then widens out with little bollards and then railings on pavement edge and a road sign.

Road widens into three lanes, central reservation changes into railing with flowers on top. Still assorted tall office buildings around. Take the right hand lane and approach roundabout. Can see cars in other carriageway through the railings. Round about large, flat with trees, grass and flowers (junction of A6008 and A610) that is a major junction for through routes and buses.

s6 Go 350 degrees round and down the **other carriageway of Maid Marian Way** and take the LH lane – have vista of dual carriageway, tall buildings and the flowered railings on the right.

s7 Ahead can see trees but turn left down **Mount Street** (one way and a bus route) before they begin. Railings on LH corner pavement as turn. On RHS 1950's block with row of shops at street level with car parking in front. On LHS, DYLS and a bus stop (no shelter). View ahead of row of lower, older varied buildings with shops. This is Angel Row.

s8 At end of Mount St NO ENTRY is written and turn right into **Angel Row** (one way) with letter box on RH corner. Wide Shopping Street on LHS varied old buildings, very few parked cars. On RHS DYLS and more modern buildings. A pair of telephone boxes with no posters on RHS before road widens to allow car parking in front of Odeon Cinema. It is a bus route and has a MacDonalds next to cinema.

LHS buildings far back, street appears very open – view ahead of trees and behind them some sort of church type dome. Down to end of street that narrows very much – word SLOW on road before zebra crossing. View ahead of Old Market Square with trees and the junction of St James St, Beast Market Hill, Long Row and Market Street. On RHS wide pavement with a block of what looks like 3 or 6 telephone boxes cannot tell if have ads as glare is a problem. Further down the pavement are three bus shelters with posters facing and parallel to the traffic.

Turn left, skirt the corner of **Old Market Square** on RHS with its trees and planters, with a view up the shopping street Long Row. It is a very busy junction with many pedestrians.

s9 Turn left into **Market Street** (two way) that is a major shopping and bus route. At its mouth is a zebra crossing with letter box on RHS of road. It goes uphill, has Debenhams on RHS, buildings grey Portland stone 1930s (?) type and brick 3 to 4 story's high with shops at street level. No parking on RHS of road, some on left. Half way up on RHS is a bus shelter with poster parallel to and facing flow of traffic. Further up the hill are two bus shelters with no posters. As approach top of the hill have view of the pillared Theatre Royal – cream and white, with mature trees to the left.

Arrow in Market St indicates turn left and there are bollards and traffic lights at the entrance to the major junction with Upper Parliament Street (A6008) – yellow hatching in the main road. Traffic island in front to right - low wall with flowers that stops shortly.

s10 Turn left into **Upper Parliament Street**, it slopes up slightly, two way traffic, two lanes each way - bus and shopping route, drive in RH lane. Tall buildings on LHS RHS mixed styles from Victorian with shops at street level. Some street parking allowed both LHS and RHS. Central fence and no parking with flowers before and after pedestrian lights starting opposite Hammonds shop on RHS and continuing to a second set of pedestrian lights and up to end of Upper Parliament St. On LHS and RHS about halfway between the two pedestrian lights are bus shelters with posters. The latter can be seen through the gap in the central reservation where pedestrians walk through. There are two similar bus shelters with posters LHS and RHS after the second pedestrian lights. In total in the stretch of Upper Parliament Street that has the central reservation there are seven bus shelters with posters three in the east lane and four in the west lane.

At top of Upper Parliament Street is a major road junction with Maid Marion Way (A6008) and Derby Road (A610) in the form of a large roundabout. It is the same one that was driven around before entering Mount Street for Angel Row – large flat with grass trees and flowers and surrounded by tall office buildings.

s11 Drive all the way around and **back down Upper Parliament Street** the other way, in the right hand lane by the central fence with flowers. Through the pedestrian lights, past the Co-op department store and the two bus shelters with posters. Through the second pedestrian lights and past the two bus shelters with posters, still in RH lane. Shop on LHS has scaffolding and netting up and in front a bus shelter with advertising in it. Through the pedestrian lights and past the end of the central fence. There was no parking in that section but some parking now on LHS and RHS. Ahead arrows in road and small traffic island in centre of road with flowers and traffic lights. Straight on in RH lane

s12 Ahead is left bend and view of a large old stone grey 4 storey corner building with smaller houses either side. In RH lane by wall traffic island. Entering very complex, one way **junction by the Theatre Royal** of nine roads, with Market Street traffic coming up from right and traffic from the other half of Upper Parliament Street opposite and traffic from the left from Wollaton Street (A610). It is a very busy, one way major route and bus junction. A lot of tall buildings and not a shopping area.. One in front on the right is scaffolded and has blue hoarding boards.

Set of pedestrian lights and odd cones by this building – in next to RH lane along by blue hoarding. Road is 4 lanes wide three for right turn one for ahead – road markings. Blue hoarding continues to traffic lights at right hand entrance to Burton Street. As turn in have view of front of the Guildhall on LHS.

s13 **Burton Street** one way, civic old grey buildings and modern ones in distance on LHS; blue hoarding and scaffolding continues on RHS – no car parking DYLS. Drive in RH lane two bus shelters, one with poster and one without on LH pavement. Through the traffic lights and in centre lane of three as Burton Street develops into **Trinity Street**, still one way. At the bottom of Trinity Street on the left hand side there are four bus shelters with posters in a row. Large concrete car park ahead on RHS with traffic lights before its exit. Skyline of very tall buildings in distance. Road widens to four lane two to bear left and two right – drive in centre right lane. Road markings.

Either side and in front tall buildings one is red brick –others are grey. Traffic lights at either side of central island at entrance into **Milton Street** (A60) that to the left is two-way.

s14 Take right turn into Milton Street that for this stretch is one way and a major bus route. Drive on to LHS. Tall buildings opposite, tall buildings on LHS with shops at street level, no car parking, pavement edge rails on LHS. Four lanes wide, drive in centre left lane.

On LH pavement there are four bus shelters with posters, in a row – also intermittent fencing. Take LH lane and down to junction turn left to Lower Parliament Street (A6008), past road signs on corner on LHS and traffic lights. Opposite view of buildings in Clumber Street behind a forest of traffic lights. Two lanes feed left, in pavement side lane.

s15 Into **Lower Parliament Street** – wide, two-way, two lanes each way, very, very busy bus and through route crowded with pedestrians. Take left hand pavement lane, there is a dashed off area that seems to be for buses and taxis next to pavement. As turn, before a pedestrian bridge there are three bus shelters with posters, in a row. Older buildings (Victorian and Edwardian) on RHS, sixties type concrete on LHS, bus and shopping route. Ahead on LHS large church tower with spire on top. Under bridge to traffic lights where lane for buses and taxis stops; it starts again after lights. After the traffic lights, there is a bus shelter with a poster.

Shops and buildings getting smaller, DYLS on LHS road signs. Boarded up shop on LHS – small shops on RHS. Road marking pavement lane left and ahead, centre left ahead. In the former, traffic lights ahead and central island with bollards. Turn left over yellow hatching into **Glasshouse Street**.

\*\*\* End of Shopping route \*\*\*

Appendix 4

Video analysis samples (eye track cursor appears as a small black square)

Figure A1: *Shopping route (eye track cursor is on the R in BETTER)*



Figure A2: Road junction with head-on poster panels (eye track cursor is on centremost panel)



Figure A3: *Shopping route bus encounter (eye track is directly ahead)*

