Measuring Driver Satisfaction with an Urban Arterial Before and After Deployment of an Adaptive Timing Signal System

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Table of Contents

List of Tables

List of Figures

Executive Summary

This report presents findings from a customer satisfaction study conducted in Cobb County, Georgia. The primary hypothesis of this study is that it is possible to develop customer satisfaction measures that are a reliable determinant of roadway quality. A signal system upgrade in Cobb County, Georgia offered the opportunity to test this hypothesis. The Cobb County Department of Transportation planned to instrument 15 signalized intersections on Paces Ferry Road with the Sydney Coordinated Adaptive System (SCATS). In order to test its proposed methodology for measuring customer satisfaction with roadway quality, the Volpe National Transportation Systems Center (Volpe Center) conducted a before-and-after study of drivers on the Cobb County urban arterial treated with the adaptive signal system control.

In addition to providing a test of the methodology, this study would also measure whether there were changes in driver satisfaction with roadway quality as a result of the deployment of the adaptive signal system control. Cobb County had recently completed a retiming of the corridor, so the current study would provide insights on whether there is value added – from the customer's perspective – when one moves from an optimized coordinated signal system control to an adaptive signal system control. In order to isolate external effects that might impact driver satisfaction ratings but which are unrelated to the traffic signal improvements, a "control" panel was also used, whereby a panel of drivers was surveyed on a comparable corridor where there was no signal system upgrade. The expectation was that drivers on Paces Ferry Road (the treatment route) would be more satisfied with the roadway quality after the system was deployed compared to pre-deployment, whereas there would be no change in satisfaction among the Spring Road drivers (the control route).

Cobb County also assessed the performance of the new signal system through an independent evaluation conducted by the Georgia Institute of Technology. Using floating cars studies, the Georgia Institute of Technology collected objective measures for travel time, speed, and delay both before and after the signal system upgrade.

Study Approach

The evaluation team determined that a pre-post study approach was the best method for measuring changes in driver satisfaction, and that the most reliable means of capturing the drivers' true experience was to have them assess roadway quality immediately following an *actual* driving experience on the road (both *before* an *after* deployment of the adaptive signal system control). The target population for this study was "regular" drivers of both the treatment and control routes. In particular, familiarity with the route was a key criterion for participation, as study participants must have some established expectations about how the road operates in order to notice a difference resulting from the signal system upgrade.

Three forms were developed and administered to each respondent on both the treatment and control routes: a telephone recruitment screener, background survey form and driver survey form (see Appendices B and C). The primary data collection tool was the driver survey form, which was designed to measure driver satisfaction with a variety of roadway attributes. It was also used to document drive conditions during the scheduled drive as well as other factors that may have influenced the driver ratings (such as schedule flexibility for that day).

Study Findings

On the treatment route, this study found that satisfaction ratings were similar across the two waves (pre versus post deployment). The only statistically significant differences were increased satisfaction with Lane Width and Roadside Landscaping. The latter can easily be explained by the seasonal variation in when the interviews were conducted; whereas wave 1 was administered in the late fall, wave 2 was administered in the spring, when the landscaping was more attractive. On the control route, drivers also registered increased satisfaction with Roadside Landscaping, but all other roadway attributes were rated similarly across the two waves (as originally hypothesized).

The evaluation conducted by the Georgia Institute of Technology drew similar findings. In their pre-post study, there was no significant improvement in the measures of travel time, speed, or delay.

For wave 1 of the Volpe study, Road Pavement Quality, Pavement Marking Quality, and Lane Width received the highest ratings among Paces Ferry drivers. The Number of Times Stopped by Red Lights, Amount of Time at Red Lights, and Driving Behavior of Others received the lowest ratings. While there were some differences between the Paces Ferry and Spring Road drivers, by and large their ratings were similar.

For the wave 2 drive, Paces Ferry drivers rated the attributes similarly: Road Pavement Quality, Lane Width, and Pavement Marking Quality received the highest ratings and Number of Times Stopped By Red Lights, Amount of Time at Red Lights, and Driving Behavior of Others received the lowest ratings. When the ratings for the Paces Ferry and Spring Road drivers were compared, the differences between the two samples in wave 2 mirrored those found in wave 1.

In addition to satisfaction, drivers also were asked to rate the importance to them of the roadway attributes. Interestingly, on the both the treatment and control route, drivers were least satisfied with those roadway attributes that were most important to them. Driving Behavior of Others is important to these drivers, but they are relatively less satisfied with it. Number of Times Stopped at a Red Light, Amount of Time at Red Lights, Overall Travel Speed, and Traffic Signal Coordination fall into this category as well.

Lessons Learned

This study offers a number of valuable "lessons learned" that future evaluators will want to consider in conducting future, similar evaluations. The following are some key lessons learned, grouped according to topic area.

1. Controlling For External Explanatory Factors

A key challenge in pre-post studies is controlling for outside factors that may provide alternative explanations for why there was a change in satisfaction. To the extent that it is possible, alternative explanations that would impact the study findings must be identified and controlled for. Researchers need to consider the following issues:

- Seasonal variation
- Traffic incidents/severe weather
- Characteristics of the individual trip (i.e., trip purpose, time of trip)
- Infrastructure changes along the route
- Traffic counts

2. Sample Design

An important study design question involves the design of the sample. In order to draw reliable conclusions about driver satisfaction with roadway performance, a representative sample should be drawn. By employing representative sampling techniques, the sample that is collected will reflect the larger population of drivers on the route, thus making it possible to generalize from the sample findings.

A key question that needs to be resolved at the outset is how will the sample be collected? In Cobb County, it made sense to sample by geographic area, since it was possible to obtain a residential telephone sample for census tracts near the study route(s). There are additional factors that evaluators will want to consider in developing the sampling strategy. These include:

- Will the sample be distributed evenly across all days of the week?
- How will the sample be distributed by time of day?

3. Sample Size

Careful consideration needs to be given to what sample size is necessary to meet the data requirements of the study. If random sampling techniques are being used, decisions on sample size will depend on how large a shift (from pre to post) you want your test to be able to detect, as well as how powerful a test is required. With larger samples, the power of the test increases.

4. Survey Design

The driver survey needs to be carefully designed in order to balance two oftentimes-competing aims: collecting the required data and maintaining a reasonable number of questions. If the survey is too long, drivers may choose not to complete it. Careful consideration needs to be given to the specific list of roadway factors that will be

evaluated. The set of roadway factors used in the Cobb County study provides a good starting point; however, depending on the characteristics of the specific roadway being tested, as well as the specific ITS enhancement that is being evaluated, items may be added (or deleted) as necessary.

5. Data Collection Procedures

Rigorous data collection procedures were used in the Cobb County driver satisfaction study in order to achieve the highest possible response rates. The following measures were utilized to insure the collection of reliable data:

- Pilot test
- Advance letter and brochure
- Incentives
- Reminder calls/emails
- Panel Maintenance letter
- Minimal time lag between the two waves
- Use of multiple data retrieval channels
- Careful monitoring of each respondent's progress, with follow-up as necessary
- Careful monitoring of respondents' survey comments during the study period

Conclusions

The findings from the Volpe driver satisfaction study and the Georgia Institute of Technology converge, indicating that in fact there was no observable improvement in roadway performance due to the adaptive signal system control. A likely reason for the null findings is that the corridor was already performing at an optimal level with respect to traffic signal coordination under the initial signal timings. Overall, these results suggest that for roadway types similar to the one evaluated in this study, the SCATS adaptive signal system control may not increase drivers' day-to-day satisfaction with their roadway experience, if the corridor is already optimally timed.

From a methodological standpoint, the findings from the Volpe study suggest that it is indeed possible to reliably measure driver satisfaction with roadway quality. Response rates were good and similar to those obtained in other transportation studies. Moreover, the driver ratings were consistent with observable roadway conditions. For example, within the last few years, Paces Ferry had been repaved, and this was reflected in the consistently higher ratings that Paces Ferry drivers gave to Pavement Quality, compared to the Spring Road drivers.

To guide future, similar evaluations, this report presents a detailed description of the methodology, a set of "lessons learned" and appendices that include all survey materials used in the study. Evaluators may find it necessary to modify the methodology, depending on the specific research question being addressed (or the specific characteristics of the test site). They will need to assess which components of the methodology can be adopted "off the shelf," and which need to be tailored.

I Introduction

Despite growing recognition that driver satisfaction with roadway quality is a useful and necessary measure, the absence of an established, validated methodology and tools for measuring customer satisfaction has resulted in a continued reliance on objective measures for assessing roadway quality. The primary hypothesis of this study is that it is possible to develop customer satisfaction measures that are a reliable determinant of roadway quality. A signal system upgrade in Cobb County, Georgia offered the opportunity to test this hypothesis. The Cobb County Department of Transportation planned to instrument 15 signalized intersections on Paces Ferry Road with the Sydney Coordinated Adaptive System (SCATS). In order to test its proposed methodology for measuring customer satisfaction with roadway quality, the Volpe National Transportation Systems Center (Volpe Center) conducted a before-and-after study of drivers on the Cobb County urban arterial treated with the adaptive signal system control.

In addition to providing a test of the methodology, this study would also measure whether there were changes in driver satisfaction with roadway quality as a result of the deployment of the adaptive signal system control. Cobb County had recently completed a retiming of the corridor, so the current study would provide insights on whether there is value added – from the customer's perspective – when one moves from an optimized coordinated traffic signal control to an adaptive signal system control. In order to isolate external effects that might impact driver satisfaction ratings but which are unrelated to the traffic signal improvements, a "control" panel was also used, whereby a panel of drivers was surveyed on a comparable corridor where there was no deployment. The expectation was that drivers on Paces Ferry Road would be more satisfied with the roadway quality after the system was deployed compared to pre-deployment, whereas there would be no change in satisfaction on the control route.

The first section of this paper presents background information on the study, as well as information on the study site. This is followed by a detailed description of the survey methods. The survey results are then presented, with the primary focus being the substantive findings on changes in customer satisfaction with roadway quality (from pre- to post- deployment). The following section on "lessons learned" highlights some of the key issues and concerns that evaluators need to consider in planning future driver satisfaction studies.

Background

This study is an extension of earlier qualitative research conducted by Pecheux, Flannery, and Lappin investigating driver satisfaction on urban arterials.[1] For their study, drivers in four different cities – Atlanta, Tallahassee, Chicago, and Sacramento-- were asked to drive a pre-determined route and to talk aloud about the factors that most affected their level of satisfaction during the drive. A key factor identified by drivers across all four

[1] See *Quality of Service and Customer Satisfaction on Urban Arterials: Final Report*.

cities was the "efficient flow of traffic." That is, drivers were more satisfied when there was a smooth progression to traffic, with minimal waiting at signalized intersections. Across all four cities drivers complained about traffic signals that were not efficiently timed and spoke about the need to coordinate the timing of multiple traffic signals in order to improve the flow of traffic. This study illustrated that drivers do notice roadway and driving conditions that are mediated by ITS-related service elements, and these conditions clearly influence their level of satisfaction with their driving experience.

Based on this qualitative work, the Volpe evaluation team proposed the development of a standard methodology for measuring customer satisfaction with roadway quality. The objective was to obtain quantitative measures of customer satisfaction through the collection of representative data, so that reliable conclusions could be drawn about customer satisfaction. The approach to evaluating a planned ITS enhancement had the following key components:

1. Conduct a qualitative pilot study to better understand the contextual variation at the selected site and to test the survey instrument for local relevance;
2. Conduct a pre-and post-survey with a panel of the same drivers on the route being treated with an ITS enhancement;
3. Conduct a control panel on a comparable route that has no planned ITS enhancement.

The details of this methodology are described in the next chapter.

Site Selection

In the first phase of the evaluation, a critical task was the selection of a site for testing the proposed methodology. Several criteria were developed for assessing the appropriateness of a potential site. First, the planned ITS enhancement had to be of sufficient magnitude to be noticed by drivers, and second, plans for deployment had to be well underway, with implementation scheduled in the near future.

The evaluation team learned that in Cobb County, Georgia, there were plans to implement SCATS along a limited stretch of an urban arterial. The route to be treated included 11 signalized intersections along a two-mile stretch of Paces Ferry Road, as well as an additional three intersections on Cumberland Parkway, a major intersecting arterial, and one intersection on Atlanta Road, on the west end of Paces Ferry Road. Based on the performance of this 15-intersection system, a decision would be made on whether or not to instrument 55 additional intersections in Cobb County with the adaptive timing signal system. After several conversations with Cobb County Department of Transportation (DOT), the Volpe evaluation team made a site visit to Cobb County to determine whether this was an appropriate test site.

According to the Cobb County DOT, this corridor was chosen for the deployment in part because of the variable traffic volumes that result from the mixed land use development. The benefits of adaptive signal system control tend to be realized when fluctuating

volumes characterize traffic conditions. Cobb County expected that SCATS would improve roadway performance, particularly during off-peak hours, when traffic is more variable. During peak hours, the network is fully subscribed, and so Cobb County did not expect significant benefits. In addition, because the corridor is somewhat isolated, it should be easier for engineers to measure the benefits of the deployment. Cobb County DOT also anticipated improved performance during non-recurring traffic fluctuations (i.e., incident, construction, etc.) and holidays. Due to the difficulty in gathering sufficient before and after data for these conditions, the Volpe evaluation is limited to day-to-day traffic, avoiding non-recurring events. However, it was hoped that the railroad crossing, with typically 30+ trains a day would allow for at least a sense of performance under non-recurring conditions.

In summary, the Cobb County site met the two key criteria for selection. Based on conversations with the Cobb County DOT, the Volpe evaluation team expected that the effects of the adaptive signal system on roadway performance should be large enough to be noticeable to drivers. Moreover, the system would be deployed relatively soon, in the fall of 2004.

There were several other reasons that Cobb County was an appealing test site for the current study. First, the corridor was already functioning at an optimal level with regard to its signal system. Approximately two years ago, major capacity improvements were made to the Paces Ferry diamond interchange with I-285, and in January 2004 updated time-of-day (TOD) signal timing and coordination plans were implemented. Given these improvements, it was the impression of Cobb County DOT that the corridor was working as well as could be expected. Consequently, this site would provide a good test of whether the adaptive signal system control (more specifically SCATS) increased driver satisfaction beyond an optimized coordinated signal system control.

Secondly, the site was appealing because Cobb County planned to collect data on the performance of the new signal system through an independent evaluation conducted by the Georgia Institute of Technology.[2] Using floating cars studies, the Georgia Institute of Technology would collect objective measures for travel time, speed, and delay both before and after the signal system upgrade. This evaluation would complement the effort by the Volpe evaluation team and would provide a useful context for interpreting the driver survey results.

In selecting Cobb County as the test site, consideration also was given to the fact that customer satisfaction is an important component of Cobb County's program. The county engineers were highly receptive to the project and welcomed the opportunity to work with the U.S. DOT to obtain direct measures of customer response to the new adaptive signal timing system.

Another component of the site selection process was the selection of the control route. During the on-site visit to Cobb County, the Volpe evaluation team considered several

[2] M. Hunter, Wu, S.K., and Kim, H.K., *Cobb County ATMS Phase III Evaluations, Draft Report*, Prepared for Cobb County Department of Transportation, October 2005.

potential control routes. Ultimately, the decision to use Spring Road as the control route was based on the following considerations:

- *Proximity to the treatment route*. The control route should be close to the treatment route, so that weather patterns are similar during the evaluation, and major incidents on the freeway would have a similar impact on both routes.
- *Similar mix of residential, retail and office development*. This helps to ensure comparability across the two routes, in that similar types of drivers, with similar trip purposes will be driving both the treatment and control routes at similar times of day.
- *Both treatment and control routes are in the same county*. While this is a less important consideration, the administration of the survey will be much easier if dealing with one county.

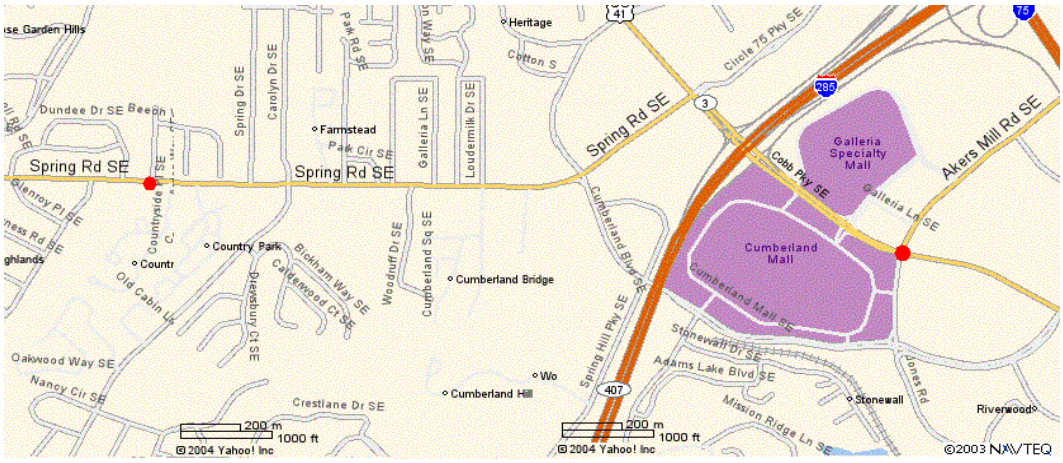
Characteristics of the Treatment and Control Routes

There are a variety of land uses along the treatment route, Paces Ferry Road. The eastern end of the route (at the intersection of Paces Mill Road) begins in historic Vinings as a two-lane facility (one lane in each direction). This section of the route is residential, with smaller retail shops as well. The route crosses over a railroad crossing (which often causes traffic back-ups) and then increases to four lanes, then six lanes at the juncture of Interstate 285, which is approximately the halfway point of the corridor. In the vicinity of the interstate exchange are several office parks (including the Home Depot national headquarters), a large shopping center with a Publix food store and a Home Depot, and restaurants. After the interstate exchange, the roadway reduces to four lanes, and becomes primarily residential. The western end of the study route terminates at the signalized intersection where Paces Ferry Road intersects Atlanta Road.

FIGURE 1: PACES FERRY ROAD

The control route is a two-mile stretch along Cobb Parkway and Spring Road that contains approximately 12 signalized intersections. Similar to the treatment route, the control route crosses Interstate 285 (one exit south of Paces Ferry Road) and also runs through retail, office park and residential developments. The roadway design is somewhat different in that there is no stretch of the control route that has a single lane in each direction. Rather, the control route consists primarily of two lanes in each direction, with more lanes where the route crosses the highway. However, this route was selected because it was comparable to Paces Ferry Road on other, more important dimensions. First, it had a similar mix of residential, retail and office development, ensuring that similar types of drivers, with similar trip purposes will be driving both the treatment and control routes at similar times of day. Second, the control route is close to the treatment route, so that weather patterns are similar during the evaluation, and major incidents on the freeway would have a similar impact on both routes.

FIGURE 2: SPRING ROAD



II Survey Methods

This section of the report describes the survey methodology, including the overall approach, the sample design, the survey design, and the data collection procedures.

Approach

At the outset, the key research question to be addressed was the following:

> *Can we reliably measure customer satisfaction, such that it is possible to determine whether an ITS enhancement significantly increases drivers' level of satisfaction with their roadway experience?*

A pre-post or panel study approach was deemed the most appropriate method for addressing this research question. In order to determine whether there has been a *change* in satisfaction, there has to be a comparison of driver satisfaction measured *before* and *after* the deployment. An alternative approach would have been to interview drivers at only one point in time -- after the deployment of the adaptive signal system control -- and ask them whether or not they were more satisfied with different aspects of roadway quality, compared to previous experience on the roadway. However, such an approach requires drivers to: 1) assess their current driving experience, 2) recall their previous driving experiences, 3) compare those experiences, and 4) calculate whether their experience has improved. The more demanding nature of this task and the potential problem with accurate recall necessarily produces less reliable data. With the current study design, drivers simply rate roadway quality at two points in time based on their immediate driving experience. The drivers are not specifically asked whether their roadway experience has improved; rather, this question is addressed by comparing the independent measurements of driver satisfaction (pre vs. post deployment of the adaptive signal system control).

The evaluation team also wanted to move beyond the qualitative methods employed in earlier work, to collect quantitative data. Surveys are a reliable, cost efficient mechanism for collecting such data. Moreover, surveys provide the most appropriate tool for meeting two key data requirements of this study, including:

- The study must provide representative results. The advantage of collecting representative data is that it is then possible to generalize from a sample of drivers to the larger population of drivers who use the route. The evaluation team wanted to insure that the opinions and perceptions of all roadway users were captured (as opposed to any one segment of users).
- The methodology is replicable. A goal of this study was to develop a standardized approach to measuring driver satisfaction, so that evaluators have a template for conducting their own studies. A standardized approach has two benefits. First, evaluators will save funds that they otherwise would have spent

on the study design, and second, if evaluators are using the same overall methodology, it may be possible to compare findings across studies.[3]

The evaluation team determined that the most reliable means of capturing the drivers' true experience is to have them assess roadway quality immediately following an *actual* driving experience on the road. While a lab experiment could have been devised whereby users evaluate roadway conditions based on videotapes (with and without adaptive signal systems), it was determined that the artificiality of the lab setting was a significant weakness of such a study design. Even if drivers in a lab setting registered increased levels of satisfaction (due to the adaptive signal system), how could we be sure that drivers on the roadway, in a real world setting, would also express increased satisfaction? During an actual driving experience, drivers have numerous demands on their attention. While this makes it more difficult to capture the effects of an adaptive signal system on driver satisfaction, it also provides a more realistic test of the hypothesis.

To strengthen the study design, a control panel was added. At the same time that the driver surveys were administered on the treatment route, the same survey would also be administered to a different set of drivers on the control route, using the exact same sampling and data collection procedures. Since no infrastructure or other roadway improvements were scheduled for the control route, the hypothesis was that there would be no increase in satisfaction on that route. The purpose of the control panel was to bolster our confidence that any increases in satisfaction on the treatment route could be attributed to the adaptive timing signal system. In other words, if there were increased levels of satisfaction on the treatment route, but not the control route, then the evaluation would feel more confident that the changes were due to the adaptive signal system. However, if there were increases in satisfaction on the treatment and control routes, then the results would be less conclusive, and one could not rule out the possibility that the increased satisfaction was due to random measurement effects.

In summary, the evaluation team concluded that the most appropriate method for collecting reliable data on driver satisfaction was to conduct a panel study whereby drivers complete a survey immediately following a typical drive on the study route, both before and after deployment of the adaptive signal system control. Moreover, the evaluation team determined that rigorous survey methods must be used to increase response rates and to insure the collection of reliable data. With higher response rates, there is greater confidence that the sample findings are indeed representative of the population. As discussed later in this chapter, every effort was made to successfully recruit and maintain the panel of drivers.

Target Population

The target population for this study was "regular" drivers of both the treatment and control routes. In particular, familiarity with the route was a key criterion for

[3] The extent to which comparisons can be made across different test sites will depend, in part, on the comparability of the test sites.

participation, as study participants must have some established expectations about how the road operates in order to notice a difference resulting from the adaptive signal system deployment. This criterion was based on the findings from the qualitative work conducted by Flannery, Pecheux and Lappin. In their study, drivers who were familiar with a particular route had developed their own personal metrics by which they judged the performance of the roadway. Some drivers, for example, knew how many light cycles it usually takes them to get through an intersection, and judged the performance of the roadway against that standard. Drivers who were less familiar with a route generally had more difficulty providing assessments of their roadway experience.

For measurement purposes, a "regular" user of the roadway was defined as a driver who drove on either the treatment or control route at least three times per week or three times per month (if their driving typically occurred on weekends). Other important criteria were used to determine eligibility. Each of these is detailed below, as well as the reasons for including the particular criteria.

Eligibility Criteria	*Reasons for Criteria*
Respondent had to have a valid driver's license	Respondents must be drivers; this criteria screens out non-drivers (as well as illegal drivers).
Respondent's household had to own at least one vehicle	If the respondent's household has at least one vehicle, there is a greater likelihood that the respondent will be able to complete the scheduled driving task.
Respondent could not be employed by Cobb County, the Georgia Department of Transportation or the US Department of Transportation.	If employed by one of these organizations, the respondent may learn about the ITS deployment and/or the evaluation.
Respondent has to be between 21 and 75	Younger drivers and older drivers may not be capable of adequately performing the required task.

Travel days for the study included Tuesdays, Wednesdays, Thursdays, Saturdays, and Sundays. Mondays and Fridays were omitted because the traffic patterns on these two days often vary (due to their proximity to the weekend). In order to participate, drivers had to regularly drive the route on one of the study days. In addition drivers qualified for the study according to the time of day at which they drove the route. Drivers were eligible for either a peak or an off-peak drive time (depending on their normal usage). Based on input from the Cobb County DOT regarding local traffic conditions, parameters were set for peak versus off- peak hours. Off-peak was defined as:

- Weekdays between 9 am and 4 pm, and
- Weekends from 7 am to 6 pm.

Weekday peak hours included:

- Morning commute (7 am to 9 am), and
- Evening commute (4 pm to 6 pm).[4]

Consequently, the study findings are representative of drivers who regularly drive the study route during the designated peak and off-peak hours.

Sample Design

Once the target population is defined, a key consideration in the study design is how will the sample be collected? The most efficient method, and the one most likely to provide representative data, included the random sampling of residential telephone numbers in the geographic areas surrounding the treatment and control routes. These households would be most likely to regularly drive on the study routes, and a random sampling of such households would provide data on drivers who use the road for a variety of trip purposes, including commute trips, shopping, personal appointments etc. One weakness of the sample design is that drivers who reside outside the census tracts in which the study routes are located were excluded from the study. While it would have been possible to expand the geographic area from which the sample was drawn, this would have been extremely inefficient and costly, due to the significant number of calls that would be necessary to find eligible drivers (i.e., those who regularly drive on the study route). Moreover, the evaluation team determined that the exclusion of these drivers who live farther away should not bias the results.

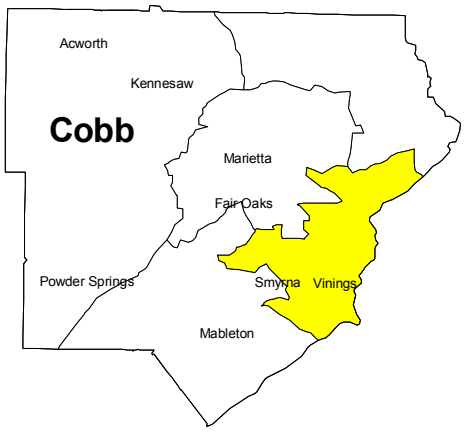
Consideration was also given to identifying businesses along the route and trying to obtain a list of employees from which a random sample could be drawn. However, it would be impossible to obtain a complete list of employees, so such a sampling frame would be biased from the outset. Moreover, such a sample would be excluding key groups of drivers, such as those who are retired, those who work inside their home, and homemakers, among others.

Incidence

An important aspect of the sampling design was to estimate how many roadway users lived in the areas immediately adjacent to the roadways, and whether those residential areas could be geographically defined in order to serve as a foundation for a random sampling of telephone numbers. This was done by focusing on the two demographic characteristics measurable through the census (vehicle ownership and driver age) as well as geography surrounding the roadways under study. The geographic analysis began at the larger PUMAs (Public Use Microdata Areas) in the Atlanta area, and then focused more intently on the census tracts within the most closely aligned PUMA. Figure 3 indicates the PUMA that contained both the control and treatment segments.

[4] The original project design called for a mid-day peak period of noon to 1 pm. However, incidence testing in the pilot study did not yield any drivers during this time period. Thus, the time period was absorbed into the weekday off-peak period.

FIGURE 3: PUMA AREA UNDER STUDY

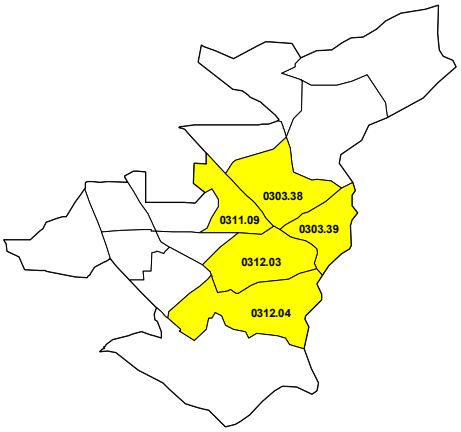


The percentage of households in this area with at least one vehicle owned was 65 percent; the percentage of households with at least one individual between the age of 21 and 75 was 97 percent. Taking both criteria into consideration, the overall eligibility rate was determined to be 63 percent. The actual eligibility rate was anticipated to be something less than this given the employment constraint (study participants could not be employed by Cobb County, the Georgia Department of Transportation or the US Department of Transportation) and the fact that respondents needed to travel on either the treatment or control segment at a regular frequency.

Sampling Strategy

The initial sampling strategy focused on drawing samples according to the census tracts that contained both the treatment and control corridors. The map below provides an outline of the PUMA area under study (corresponding to the highlighted portion in Figure 3) and the census tracts that comprise that PUMA. The highlighted tracts are those that were the focus of the sampling effort for this study.

FIGURE 4: SELECTED CENSUS TRACTS



In addition, the sampling strategy called for oversampling off-peak drivers. Since Cobb County DOT expected that the greatest benefits of the adaptive signal timing system would be experienced during off-peak hours, the evaluation team wanted to oversample this group of drivers in order to have a sufficient sample size for capturing a change in satisfaction. The decision was made that two-thirds of the study drives should be comprised of off-peak drives.

Survey Design

The design of the survey instrument was based on the overall objectives of the study and an assessment of what specific data were required in order to meet the study objectives. The following three forms were developed and administered to each respondent on both the treatment and control routes: a telephone recruitment screener, background survey form and driver survey form (see Appendices B and C).

The recruitment screener was used to determine driver eligibility, document roadway usage, obtain demographic information, and schedule the drive date and time. Drivers who were found to be eligible and who agreed to participate were then asked a short series of questions about their "typical" usage on the roadway in order to assign the driver the most appropriate day and time slot. The successful administration of the recruitment screener was largely dependent on appropriate training of the interviewing staff. The staff was shown video of the treatment route and was required to familiarize themselves with the names of the intersecting roads as well as landmarks (i.e., Home Depot Headquarters, the Publix, etc.). In this way, the interviewer could more easily collect the data and could earn the trust of the participants.

The background information form was used to obtain data about the recruited driver's typical trip on Paces Ferry Road (or Spring Road). Key characteristics of the "typical" trip are documented, including trip origin and destination, trip purpose, trip distance (miles), trip time (minutes), number of stops typically made on trip, level of concern about on-time arrival, and degree of flexibility regarding when the trip can be made. The evaluation team wanted to be able to measure the relationship between these trip characteristics and the driver satisfaction items. Drivers were also asked to rate the importance (to them) of the roadway attributes when they make the trip. Information about the drivers' vehicle and general driving habits was also collected.

The primary data collection tool was the driver survey form, which was designed to measure driver satisfaction with a variety of roadway attributes. It was also used to document drive conditions during the scheduled drive as well as other factors that may have influenced the driver ratings (such as schedule flexibility for that day).

For the driver satisfaction measures, a seven-point scale was used, with the endpoints of the scale defined for the driver (1 being not satisfied and 7 being very satisfied). In designing the question on driver satisfaction, a key question at the outset concerned the appropriate scaling for the satisfaction items. Would a 5-point scale suffice, or would a 7-point or a 10-point scale be more

appropriate? According to the literature, the type of scale that is used should be guided by the nature of the research question. Given that the ultimate objective of the Cobb County study was to measure change in satisfaction, the scale had to consist of enough points to reliably capture a change in satisfaction, but at the same time, the scale had to be meaningful to drivers. For this reason, a seven-point scale was chosen. This would provide sufficient discrimination to measure changes in satisfaction, but would not prove too unwieldy for the driver.

The development of the list of roadway attributes was based largely on the qualitative research conducted by Flannery, Pecheux and Lappin. Attributes consistently mentioned as most important by drivers of that study were included in the Cobb County driver survey (as long as they were relevant to the particular study site). The roadway attributes that were evaluated include:

- Lane Width
- Quality of Road Pavement
- Quality of Pavement Markings
- Roadside Landscaping
- Driving Behavior of Other Drivers
- Overall Level of Traffic Congestion
- Number of Times Stopped by a Red Light
- Amount of Time Spent at Red Lights,
- Amount of Green Time for Side Streets
- Coordination of Traffic Signals Along the Route
- Your Overall Travel Speed
- Availability of Turn Lanes

Four of the measures pertained to different aspects of traffic signal coordination, the key focus of the study. The qualitative interviews in the study conducted by Pecheux et al. revealed that drivers used different metrics for evaluating their satisfaction with traffic signal coordination. While some drivers spoke specifically about "traffic signal coordination," others assessed their experience (and their satisfaction) according to the number of times they had to stop at a red light, or alternatively the amount of time they had to wait at a red light. Others mentioned the amount of green time to side streets (i.e., too much green time to side streets decreased driver satisfaction). Each of these measures was included in the driver survey in order to capture the full range of drivers' experience on the roadway.

Additional measures, unrelated to traffic signal coordination (for example lane width and quality of road pavement) were also included in the survey. There were several reasons for this. First, the evaluation team did not want to tip off drivers that the main focus of the study was the evaluation of traffic signal coordination along the route. By including a variety of roadway attributes in the survey, attention would not be drawn to the issue of traffic signal coordination. Second, it would be useful to compare wave 1 and wave 2 driver ratings for roadway attributes that did not change, such as Lane Width, Quality of Road Pavement, and Quality of Pavement Markings.[5] The consistency of the ratings from wave 1 to wave 2 on these measures provides a test of the robustness of the method. Finally, by including a full range of roadway attributes, it is possible to conduct analyses regarding the relative importance of different roadway attributes in determining overall driver satisfaction, and so provide a richer understanding of the factors related to driver satisfaction in Cobb County.

[5] Cobb County Department of Transportation assured the evaluation team that during the study period, the upgrade of the traffic signal system was the only change to roadway conditions, so the measures of the other roadway characteristics should not vary significantly across the two waves.

The driver survey administered in wave 2 was identical to the driver survey administered in wave 1, with one exception. At the end of the wave 2 survey, drivers were asked to comment (in an open-end question) on whether or not their driving experience had changed over the last few weeks. This question was added to provide respondents with another means for reporting on any improvements with traffic signal coordination (see Appendix F for wave 2 driver survey).

Pilot Test

Prior to wave 1, a small pilot test was conducted with ten drivers. The purpose of the pilot test was threefold: (1) to conduct a "dress rehearsal" of the planned approach designed for use in the full study, (2) to test the questionnaire wording and understanding, and (3) to debrief respondents about their participation experience and reactions to materials. The related objectives included:

- Examine how well the data collection approach planned for the full study works
- Evaluate how well the questionnaire works and confirm that the data items collected through this process will enable us to estimate changes in driver satisfaction.
- Evaluate respondent reaction to the survey process

A 5-stage approach planned for the full study was tested, in whole or in part, as part of the pilot test. The stages to be tested included: advance notification, recruitment, provision of materials, driver reminders, and survey completion and debrief. Each stage was evaluated using questions agreed upon prior to the start of the pilot. The following section of the report provides detailed findings regarding each stage.

Advance Notification

The advance mailing was not tested in the pilot, given the desire to use the debrief interviews to identify key issues that would form the content of the advance letter and study brochure. Because the timing of the receipt of the advance mailing vis-à-vis the recruitment call is important, the length of delivery time for first-class letters between the research facility (from which all materials would be mailed) and Atlanta was tested. Specifically, three letters were mailed using first-class postage from the research facility on Thursday, September 9, 2004 to different locations in Atlanta. All three letters were reported received on Monday, September 13th. The mailing took a total of 4 "mail" days to reach the Atlanta residents (given that no mail activity takes place on Sundays). Thus, for the full-study, advance letters should be mailed 5 days prior to the planned recruitment call.

Recruitment

The purpose of the recruitment effort for the pilot was to secure the participation of 10 local drivers. These calls were made by research staff, focusing on telephone numbers known to belong to residences along the target route of Paces Ferry Road between

Atlanta Road and Paces Mill Road. Ten drivers were recruited to participate and were assigned to the following drive times:

TABLE 1: PILOT TEST DATA COLLECTION TARGETS

Day of Week	AM Peak (7-9 am)	Noon Peak (noon – 1 pm)	PM Peak (4 – 6:30 pm)	Weekday Off Peak (all other hours)	Weekend Off Peak (all hours)
Tuesday	1	0	1	1	
Wednesday	2	0	1	2	
Saturday					1
Sunday					1

One interesting finding was that none of the respondents reported traveling on Paces Ferry Road during the peak noon hour. Given the low incidence of drivers in this time period, it was decided to schedule drivers for only one weekday "off peak" time period of 9 am to 4 pm.

The pilot test provided insight on a number of different aspects of the recruitment effort, including the overall performance of the recruitment screener, respondent questions about the survey process, average number of calls required to reach an eligible driver, reasons for refusal to participate in the study, and the length of the recruitment interview. Overall, the recruitment screener worked very well; respondents did not have any problems with the recruitment questionnaire, nor did they have any questions about the survey process. Familiarity with the target route was definitely a key to discussing and qualifying respondents to participate in the survey. It was noted that interviewer training needed to focus on the landmarks and locations along both the control and target routes, as well as the screening questions, in order to ensure that respondents were correctly qualified and assigned to the "best" time slot given their usual driving habits.

The recruitment interview length was shorter than anticipated, averaging eight minutes instead of ten minutes. This suggested that there was room to add a few additional questions. From a textual perspective, the interviewing team felt that they needed to enforce the notion of driver satisfaction along the target and control routes, making the questionnaire more conversation oriented. Specific wording in the introduction and recruitment text were targeted for improvement.

Of the 40 pieces of sample dialed, 10 resulted in recruits, 19 were disconnects (no new number), 4 additional were "new numbers" (in which case respondents were no longer qualified as they didn't drive Paces Ferry Road after their move), and the remainder were "non-contacts." An average of 2.5 call attempts were made for each eligible sample piece.

None of the respondents refused to participate. Two households were found to be ineligible because they moved and no longer drove on the target route, five households reported no drivers traveling along that route, and two drivers were too old to participate.

In addition, one household reported making 2 round trips per week on Paces Ferry Road. Although this translated to 4 trips and could have been eligible for the survey, that household was not recruited given the goal of including drivers with more typical travel on specific days of the week.

Provision of Materials

Nine of the ten drivers were mailed a packet[6] that included a cover letter (thanking them for their participation, confirming the assigned drive time, conveying the importance of their participation, and reminding them of the general survey process), a "background survey" collecting details about their typical travel, and the "driver survey" to be completed after their scheduled drive. The packets were mailed via priority or overnight services, depending on the scheduled drive time. Volpe letterhead was used for the cover letters. All of the respondents received their packet of materials, with the exception of one, whose drive had to be rescheduled because the packet was left at her neighbor's door.

Driver Reminders

The day prior to the assigned drive time, the survey process called for the research facility to send an email reminder (where available) AND make a telephone reminder call to the driver. The purpose of the reminder call was fourfold: (1) to confirm receipt of the packet, (2) to reconfirm driver participation at the scheduled day/time, (3) to answer any questions about the survey process, and (4) to schedule the best date/time for the post-survey call and debrief (note – in the full study, the retrieval would be passive. The retrieval call was for purposes of the pilot only.)

Very few respondents were reached during the reminder calls. Those that were reached acknowledged and appreciated the call. One respondent indicated she did remember her scheduled drive time, but appreciated the reminder. Reminder emails were sent to two respondents, both of whom acknowledged receipt. Of the respondents who were reached during the reminder call, none of them had questions about the survey process.

Survey Completion and Debrief

At the appointed time or the day following the scheduled drive time, each driver was re-contacted to obtain their survey responses and to debrief them on their participation experience. In the full study, an Internet-based "web" survey, fax, and mail-back options were offered, with telephone follow-up to clarify any inconsistent responses. For the pilot, however, the survey research firm wanted the in-person interaction to talk about the drivers' experiences and probe for details that will be important in conducting the full study. Four respondents ultimately answered the survey questions and were debriefed on their experiences.

[6] The tenth driver had requested his documents be delivered via email.

Reaching the respondents after the scheduled drive time proved difficult. The pilot schedule bumped up against the Labor Day weekend and was accompanied by extremely bad weather, which made weekend follow-up very ineffective. One respondent (whose wife was also recruited) was reached 4 times and each time told us to talk to his wife ("she had the forms"). Three other respondents indicated conflicts that precluded their participation in the study (after the fact). One respondent (who preferred electronic communications) never responded to either email or telephone message requests for his information.

The interview and debrief averaged fifteen minutes. The reporting of the background and driver information went quickly and smoothly. The debrief questions took longer, given the qualitative nature of the questions. Overall, the debrief revealed that the survey instruments worked well. The only question that had to be revised was G2 on the Background Survey, as the original phrasing of the question was confusing to respondents. Otherwise, no problems were reported with the background or driver survey forms. However, all four respondents asked about the purpose of the study. Most were concerned that "they" would try to widen Paces Ferry Road in the historic Vinings section, which would "ruin" the character of that area. They also felt that the main problem was the railroad crossing, but felt there was no specific design solution. Finally, two drivers noted that their driving experience was vastly improved since the I-285 interchange had been redone.

Based on this feedback, the evaluation team felt it was important that the survey materials should re-iterate the purpose of the study and that the results would not be used to make physical changes to the roadways. In addition, the pilot study revealed that there should be a convenient way to reschedule and not lose any respondents due to unexpected occurrences precluding the scheduled drive.

Pilot Test Conclusions

Initial respondent reaction to the survey was positive. Of all respondents contacted for potential participation in the study, there were no refusals. Interested respondents were screened and terminated as ineligible (they did not drive on Paces Ferry Road at all or on a regular-enough basis) or because they were too old. Those respondents that completed the survey indicated that the survey task was explained well, they understood what was being requested of them, and how to complete the background and driver survey forms.

It was disappointing that only four respondents completed the pilot. Of the six respondents that were recruited but did not complete the survey, three had unplanned events that prevented them from making a "normal" drive, the other three could not be re-contacted after the reminder call/email. Recommendations to boost response rates included changes to the timing of the reminder call, pre-payment of the incentive (rather then payment after the task), and adding a reminder postcard to arrive the day prior to the scheduled drive. Other details or recommended changes included:

- All mailings should be sent five days prior to the planned contact to allow sufficient time for delivery.
- Plans to offer a website for entry of results should proceed as a means of increasing response.
- The recruitment text needed to be strengthened with regard to study objectives and how the results will be used.

Data Collection Procedures

The data collection procedures incorporated features designed to elicit the highest possible response rate from eligible drivers. During the first stage of the study, a study brochure was mailed to all households in the sample for which a name and address were known prior to the recruitment call. This brochure served as advance notification to the household that it had been randomly selected for the study and that it would be receiving a call shortly asking members of the household to participate (see Appendix A).

The brochure provided information about the purpose of the study. Participants were not told about the specific objectives of the study, as this might bias their perceptions. The brochure stated that: "*The results will be used to develop satisfaction ratings that can then be used when identifying and prioritizing roadway improvement projects*." The pilot test revealed that residents were concerned that the findings from the study would be used to make physical changes to the roadways, particularly near the historic Vinings area. To address this concern, the brochure tried to reassure potential respondents that: "*The results of the study will be used to help transportation planners across the country make the most of limited funds by focusing them on improvements that do not involve new road construction but are directly related to driver satisfaction.*"

The brochure also served as a tool for legitimizing the study and for conveying the overall importance of the project. To this end, the brochure listed the United States Department of Transportation as the sponsor of the study, and explained that the survey was being conducted in cooperation with the Cobb County Department of Transportation. The link to local government was used to emphasize the local relevance of the study to the participant (i.e., you can help shape future transportation projects in your local area). In addition, the brochure provided contact information for the U.S. DOT study manager should participants have any questions.

The recruitment interview was administered using Computer Assisted Telephone Interviewing (CATI). Each sampled household was telephoned by an interviewer who administered the recruitment screener and scheduled a drive with the respondent. As previously mentioned, travel days for the study included Tuesdays, Wednesdays, Thursdays, Saturdays, and Sundays, and respondents were assigned to a day of the week according to when they typically drove the route.

After agreeing to participate, eligible respondents were mailed the study materials, including a cover letter, a five-dollar incentive, the background information form, the driver survey, and a postage-paid envelope for returning the survey. The cover letter,

printed on Volpe letterhead, was used to re-iterate the purpose and importance of the study, to provide general information and instructions on the survey process, and to thank the respondent for their participation. Drivers were asked to complete the background information form prior to their scheduled drive, whereas the driver survey was to be completed immediately *following* their drive. Respondents could return the background form and the driver survey either by mail, internet, or fax.

The night prior to the assigned travel day, reminder calls were made to each driver to confirm that they had received the materials, to answer any questions that the respondent might have, and to re-iterate the importance of the study (thus increasing the likelihood that they would complete the task). In addition, a reminder postcard was mailed to respondents so that it would arrive the day before the scheduled drive.

Table 3 shows the distribution of the 1,470 recruited drivers by route, time of day (peak/off peak) and day of week (weekday or weekend). The assignment of drivers to peak and off-peak was intentionally set at 33% peak, 67% off-peak.

TABLE 2: DISTRIBUTION OF RECRUITED WAVE 1 DRIVERS BY TIME OF DAY AND DAY OF WEEK

	Paces Ferry Road			Spring Road			Grand Total
	Peak	Off Peak	Total	Peak	Off Peak	Total	
Weekday	294	240	534	199	112	311	845
Weekend		347	347		278	278	625
Total	294	587	881	199	390	589	1,470

In between the two waves, the survey research firm mailed respondents a letter thanking them for their participation and indicating the upcoming and final phase of the study. Enclosed in the letter was a $2 incentive, used to increase the likelihood that the respondent would complete wave 2 of the survey.

In early April, after the adaptive timing signal system had been deployed, respondents were re-contacted and the recruitment screener was re-administered in order to assess eligibility. In order to re-qualify, respondents had to continue to be regular users of the route, and the timing of their "typical" drive had to be consistent with wave 1 (peak vs. off-peak). Based on a review of the transportation literature, the evaluation team determined that a change in trip purpose could be permitted as long as the wave 2 trip still fell into the same general trip category as wave 1, namely: 1) subsistence/mandatory (commute, work related trips), 2) maintenance (shopping, personal business, medical etc), or 3) discretionary/leisure. The driver survey was mailed to eligible respondents, along with a $10 incentive, and the same data collection procedures used in wave 1 were repeated for wave 2.

Table 4 shows the distribution of the 724 recruited wave 2 drivers by route, time of day (peak/off peak) and day of week (weekday or weekend).

TABLE 3: DISTRIBUTION OF RECRUITED WAVE 2 DRIVERS BY TIME OF DAY AND DAY OF WEEK

	Paces Ferry Road			Spring Road			Grand Total
	Peak	Off Peak	Total	Peak	Off Peak	Total	
Weekday	153	129	282	94	52	146	428
Weekend		180	180		116	116	296
Total	153	309	462	94	168	262	724

Data Processing

Data processing took place throughout the study, beginning with the creation of the advance brochure mailing, continuing with the release of sample for recruitment, processing recruitment data for the respondent mailout, appending the background and driver survey data to the master tables, and performing initial quality control measures on the data. The same steps were repeated for wave 2. A master control file tracked the progress of each driver through the various survey stages, with codes to allow immediate identification of problem cases that were not progressing according to schedule as well as confirmation that cleared cases moved along as appropriate. All cases were manually checked to confirm that the driver used the selected route according to project criteria. When driver surveys were not returned, multiple attempts were made to contact the driver to determine the reason why the survey had not been returned (didn't make the scheduled drive, forgot to put the survey in the mail, etc.) and whether the drive needed to be rescheduled.

Coordination and Scheduling of the Driver Surveys

In addition to developing the sampling methodology and data collection procedures, another important aspect of this study was the scheduling of the survey administration period. With panel studies, where a survey is administered before and after a particular treatment, the timing of the surveys is necessarily more complicated, as the administration of the surveys is contingent on the timing of the treatment (in this case, the adaptive timing signal system). Any delay in the deployment of the ITS results in a delay to the survey schedule.

For the Cobb County study, the installation of the adaptive signal system was scheduled for fall, 2004. The tentative evaluation schedule was to conduct wave 1 in the late summer/early fall and then conduct wave 2 in the early spring, once the new system was functioning optimally and drivers had several weeks to experience the new system. One schedule constraint was that the second wave of the study had to be completed before the end of the school year (the third week of May). The evaluation team did not want to conduct the second wave during the summer months, when typical driving (and traffic) patterns tend to change as result of schools being closed, and thus might have an effect on driver ratings.

During the summer of 2004 it became evident that there would be a delay in the installation of the adaptive timing signal system, as the Cobb County Department of Transportation had to re-bid the project. Based on assurances from the Cobb County Department of Transportation that the delays would not be significant, the evaluation team decided to proceed with the administration of wave 1 during the fall.

The survey research firm allotted approximately 6 weeks to complete the first wave of driver surveys, including the initial mailing, the recruitment of respondents and the conduct of the actual drives. Drives were scheduled beginning on October 26, 2004. Wave 1 drives were to be completed approximately 4 weeks later, prior to the Thanksgiving holiday. The evaluation team wanted to avoid conducting any drives during the Thanksgiving holiday weekend or during the December holiday season.

The number of completed surveys collected during the four-week period prior to Thanksgiving fell somewhat short of the desired targets. Based on wave 1 retrieval rates, the survey research firm was concerned about reaching its final target: 400 interviews at the end of wave 2. Consequently, in January and early February, additional respondents were recruited on both the treatment route (N=150) and the control routes (N=50), with the goal of obtaining an additional 130 completed interviews. For the control group, the number of recruits was further increased by 450 in order to obtain approximately 300 additional completed surveys. This large increase in sample size for Spring Road would improve the statistical reliability of the data.

During the winter months, the evaluation team maintained close communication with the Cobb County DOT in order to track the progress of the installation of the adaptive timing signal system. Based on the schedule for the deployment, the evaluation team had to determine the appropriate timing of the panel maintenance letter, as well as when to begin recruitment for wave 2. Before the administration of the second wave, the evaluation team wanted to insure that the system was working optimally and that drivers had at least a couple of weeks to experience the new system.

The adaptive signal system was installed at the end of February, and significant tweaking of the system occurred in March. With the concurrence of the Cobb County Department of Transportation, the Volpe evaluation team began data collection for wave 2 of the study in early April. At the same time that the Volpe survey was fielded, the Georgia Institute of Technology collected its “after” data on travel time, speed, and delay. The schedule was very tight for wave 2 of the study, and so aggressive targets needed to be set to achieve the desired number of interviews. Both the Volpe team and the Georgia Institute of Technology were working under similar schedule constraints; they needed to complete data collection no later than the third week of May when schools would close (due to changes in traffic patterns during the summer months).

Response Rates

As detailed in previous sections of this chapter, significant efforts were made to achieve a high response rate. With higher response rates, there is greater confidence that the

sample findings are indeed representative of the population of drivers who regularly drive on the route.

The overall response rate for wave 1, calculated according to standards established by the Council of American Survey Research Organizations, was 32% (this included a 50% recruitment rate and a 63% completion rate). This means that of all eligible households contacted, half agreed to help with the survey but 32% actually completed all wave 1 activities.

The corresponding wave 2 survey response rate is a straightforward calculation that involves the total number of drivers that agreed to participate in wave 2 divided by the number of panel members eligible for wave 2. Of the 924 drivers that completed the wave 1 survey:

- 724 agreed to complete the wave 2 survey
- 84 were no longer eligible (either due to a change in travel patterns or because they moved) for the wave 2 survey
- 42 drivers adamantly refused to participate in wave 2 activities
- Contact could not be made with 74 drivers, despite attempts varied by day of week and time of day.

Thus, the wave 2 response rate is 71% and is calculated by dividing the number of drivers who completed the wave 2 survey by the total number of drivers still eligible for the wave 2 survey (594/840).

III Survey Findings

The final data set for the Cobb County Driver Satisfaction Study contains data for the 1,470 drivers initially recruited to participate in the survey, the 924 drivers who completed the wave 1 survey, and the 594 drivers who completed both wave 1 and wave 2 surveys. These drivers provided information about their travel patterns on Paces Ferry and Spring Roads, as well as general travel characteristics such as annual miles traveled and on what type of roadways. Each driver was assigned a specific day and time to drive the selected route in the course of typical travel and then asked to complete a survey evaluating that drive. The data obtained through this study will be used to evaluate driver satisfaction with specific roadway characteristics.

The purpose of this chapter is to summarize the study findings. It is organized about the following topics: first the drivers – their demographic characteristics. This is followed by a summary of travel patterns, both in general as well as specifically on Paces Ferry and Spring Road and associated driver importance and satisfaction ratings. In the final section, correlations among the characteristics and ratings are presented.

Driver Summary

Drivers were randomly recruited from the residential areas surrounding Paces Ferry and Spring Road. This section provides a demographic description of the drivers, which were obtained during the wave 1 recruitment call. Descriptors include gender, age, educational attainment, employment status, and income.

Overall, the Cobb County driver study obtained a good distribution of drivers by key socio-demographic characteristics. The drivers were generally well represented in terms of gender (48% male, 52% female on Paces Ferry Road), with no statistical differences between the two routes. Based on eligibility requirements, drivers had to be between the ages of 21 and 75, and overall the final sample of Paces Ferry drivers had a good distribution of age ranges. There were fewer drivers in the youngest age cohort; only 8% were between the ages 21 and 29. An additional 25% were between the ages of 30 to 39, 24% were between the ages of 40 to 49 and 26% were 50 to 59 years of age. Close to one-fifth of the sample fell in the oldest age category (18% were 60 to 75 years of age).

For several demographic measures, there were significant differences between drivers of the two routes. Overall, a majority of the drivers reported having at least some college education; however, the Paces Ferry drivers were better educated, with significantly higher numbers having a graduate degree. With regard to income, the drivers tended to be drawn from higher income groups, and this was especially true for the Paces Ferry drivers. Forty-six percent of Paces Ferry drivers reported annual household incomes of $100,000 or more, compared to 18% of Spring Road drivers. These differences in the demographic composition of the two samples were not deemed problematic, however,

since the key focus of the study was to measure changes in satisfaction *within* each sample (differences in ratings *across* the two samples were of secondary interest).

Most drivers were employed either full-time or part-time, with no significant differences between drivers of the two routes. In terms of household size, the samples tended toward smaller households in general, though the Paces Ferry drivers reported larger household sizes, on average than the Spring Road drivers (65% of Paces Ferry drivers reported one or two person households, compared to 75% of Spring Road drivers).

Travel Patterns

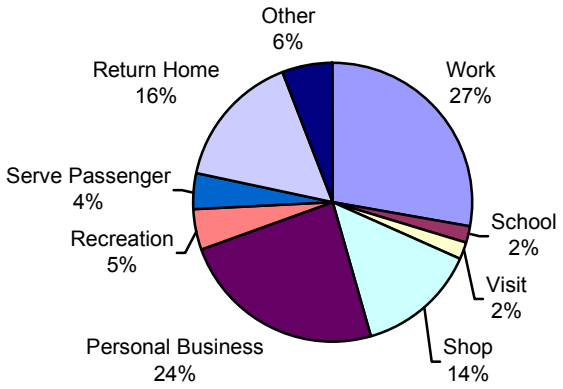
In addition to understanding demographic differences between drivers, it is also important to note any differences in travel patterns that might impact satisfaction ratings. In this section, information about general usage of the target and control routes is presented. Information about roadway usage was obtained during the recruitment interview. At that time, drivers were asked whether they used the roadway at specific times of day and days of week. If they indicated affirmatively, trip purpose was also obtained.

Table 5 shows when the Paces Ferry drivers are using that roadway during the travel times of interest to the study. As shown in that table, two-thirds of drivers are using Paces Ferry in the PM peak, with about half each reporting usage during the AM Peak or mid-day time period (the responses for each day/time cell are unique, so one driver could conceivably drive on Paces Ferry during all three time periods) for a given weekday. In terms of trip purpose, most of the trips were either to go to work or for personal business/shopping.

TABLE 4: TRAVEL PATTERNS – PACES FERRY USAGE

Day of Week	AM Peak (7-9 am)	PM Peak (4 – 6 pm)	Weekday Off Peak (9 am to 4 pm)	Weekend Off Peak (7 am to 6 pm)
Tuesday	194 (51%)	252 (66%)	190 (50%)	
Wednesday	198 (52%)	255 (67%)	199 (52%)	
Thursday	196 (51%)	246 (64%)	187 (49%)	
Saturday				327 (85%)
Sunday				301 (79%)

FIGURE 5: TRIP PURPOSE ON PACES FERRY

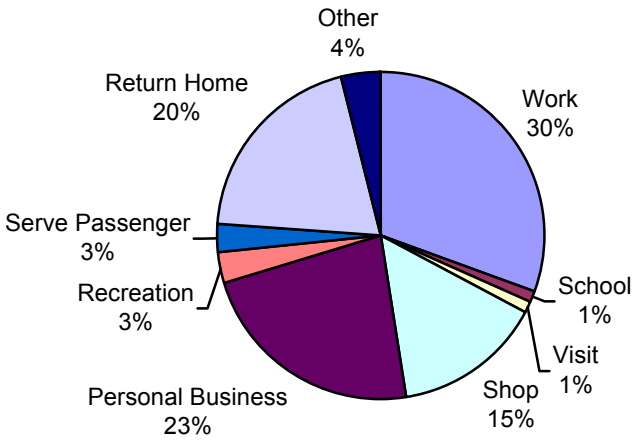


Roadway usage was similar on Spring Road. There, almost three-fourths of the drivers were on the roadway during the PM peak period, with about half also reporting using the roadway in the AM peak and off-peak as well. Most drivers (81%) reported Saturday travel on Spring Road, with 75% also reporting Sunday usage. In terms of trip purpose, Work was 30% of the trips, Personal Business was 23%, and Returning Home was 20%.

TABLE 5: TRAVEL PATTERNS – SPRING ROAD USAGE

Day of Week	AM Peak (7-9 am)	PM Peak (4 – 6 pm)	Weekday Off Peak (9 am to 4 pm)	Weekend Off Peak (7 am to 6 pm)
Tuesday	110 (52%)	153 (73%)	92 (44%)	
Wednesday	113 (54%)	150 (71%)	91 (43%)	
Thursday	111 (53%)	152 (72%)	96 (46%)	
Saturday				170 (81%)
Sunday				158 (75%)

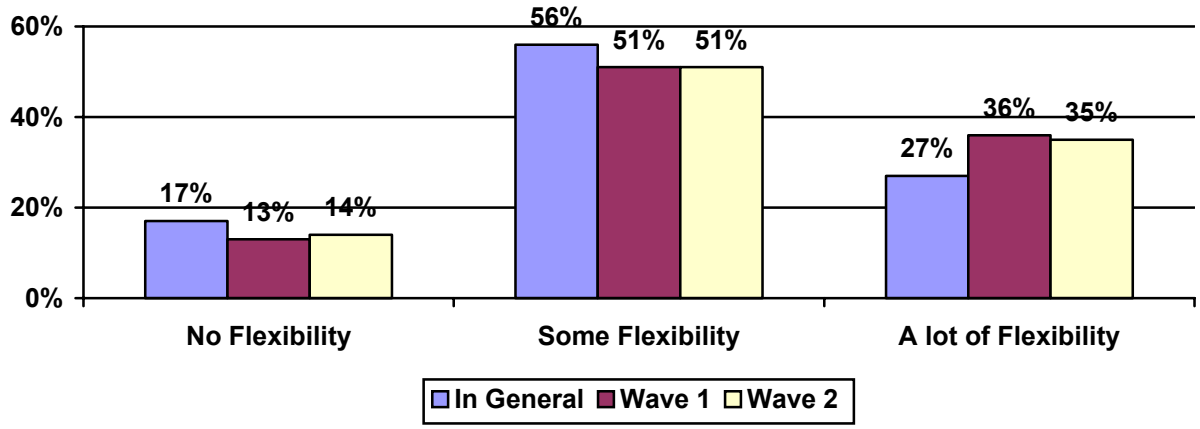
FIGURE 6: TRIP PURPOSE ON SPRING ROAD



Comparison of Questions on Both Driver and Background Surveys

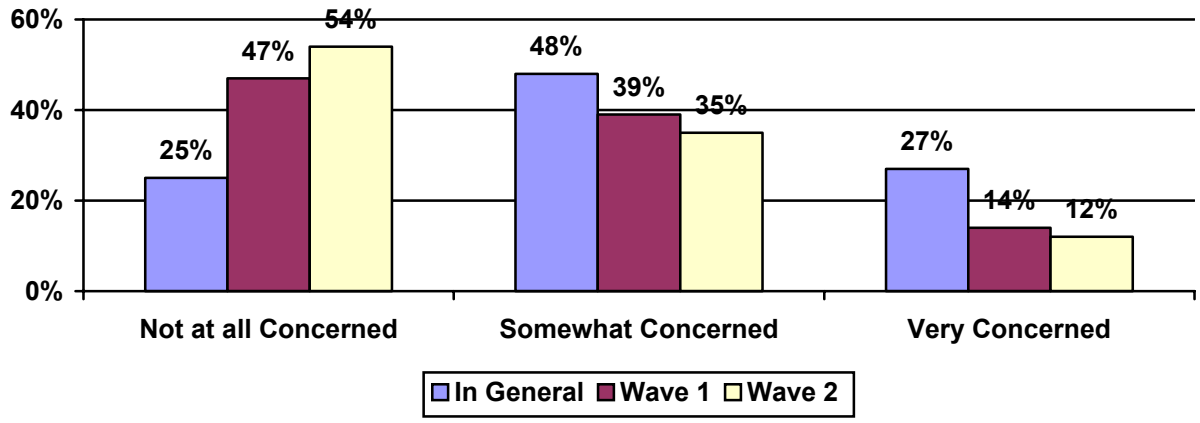
The background survey was designed to help set the trip in the mind of the driver, as well as obtain general information about the constraints faced by the driver and activities normally undertaken when making the scheduled trip. The driver survey followed up to determine how "typical" this trip was by asking similar questions. The differences between responses to these parallel questions are presented in this section. This includes questions about flexibility in when to make the trip, concerns about on-time arrival, others riding in the vehicle, and typical activities while making the drive.
In terms of trip flexibility, the drivers reported having more flexibility on the day of their scheduled drive than in general. This was consistent across both wave 1 and wave 2 reports.

FIGURE 7: USUAL VS. ACTUAL FLEXIBILITY IN TRIP MAKING TIME



Drivers were also asked how concerned they were about getting to their destination on time. As shown in Figure 8, drivers again report lower levels of concern on the actual day of the drive, compared to "in general" (as reported in the Background survey). One explanation for this may be that many drivers scheduled for a weekend drive also drove during the week. So it may be possible that they filled out the background form thinking about their most typical usage, which is a work trip, while due to the desire to have off-peak observations, they were assigned to a weekend time slot. During wave 2, drivers were somewhat less concerned about on-time arrival than they were for wave 1.

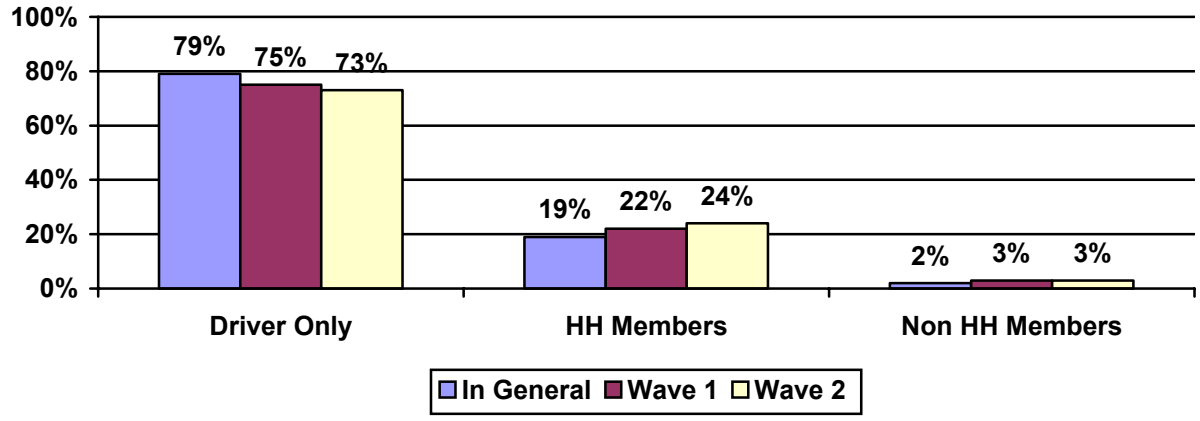
FIGURE 8: USUAL VS. ACTUAL CONCERN ABOUT ON-TIME ARRIVAL



Many in-vehicle factors are known to influence driver satisfaction ratings. This includes whether there is anyone else in the vehicle with them and what their activities are during the actual drive. The differences between "typical" and "actual" with regard to companions, cell phone usage, listening to music, listening to talk shows, eating, and other in-vehicle activities are shown in Figures 9 and 10.

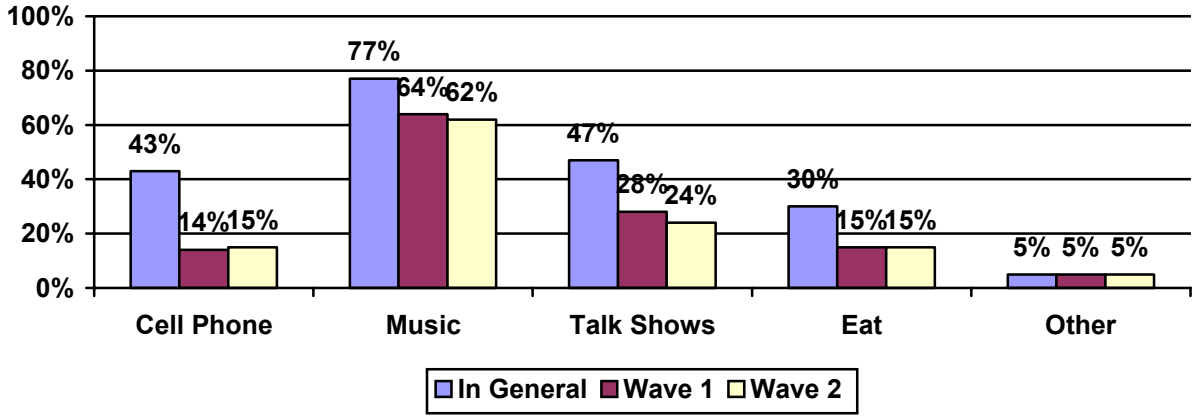
As shown in Figure 9, there was little difference in general vs. actual companions, suggesting that any analysis of the wave 1 and wave 2 results does not need to adjust for having different people in the vehicle with the driver than those who normally accompany.

FIGURE 9: USUAL VS. ACTUAL COMPANIONS



In terms of activities, the reported activities on the actual drive (for both wave 1 and wave 2) were consistent and lower than the general background information provided. This may be an artifact of people recording on the background form all activities they usually do (but not specific to their evaluation drive) but only recording what was done on the actual drivers on the driver surveys. (Note: the "other" activity category was most often referring to the driver talking with others in the vehicle.).

FIGURE 10: USUAL VS. ACTUAL ACTIVITIES



Driver Ratings

The focus of the study was to obtain documentation on importance and satisfaction ratings by drivers for specific roadway characteristics, and to document the change in those ratings after the installation of the adaptive signal system control. The survey instruments were designed to obtain importance ratings as well as satisfaction ratings. Both are important in interpreting the driver's perspective (for example, most drivers reported a high satisfaction rating for landscaping, but it is not really important to them). In this section of the report, the initial importance and satisfaction ratings are presented overall and for drivers on each roadway segment.

Figure 11 shows the overall importance ratings, as well as ratings for Paces Ferry and Spring Road drivers separately. As indicated, the driver importance ratings were very similar and except for two attributes, there was no difference in their ratings. For Paces Ferry drivers, as well as Spring Road drivers, the most important roadway attributes include Traffic Congestion, Driving Behavior of Others and Traffic Signal Coordination, while the least important aspects of their drive are Roadside Landscaping, Lane Width, and Amount of Green Time to Side Streets. There was a statistically significant difference in the ratings for only two attributes; Paces Ferry drivers found Roadside Landscaping and Driving Behavior of others to be less important than the Spring Road drivers did. The difference on Roadside Landscaping may be due to the fact that Paces

Ferry Road is a more visually pleasing road to drive on, and so roadside landscaping may not be as important to Paces Ferry drivers (they take it for granted).

In addition, it was interesting to note that drivers rated Traffic Signal Coordination and Amount of Time at Red Lights as more important than Overall Travel Speed, suggesting that drivers on urban arterials prefer continuous movement to higher travel speeds. This confirms the findings of the qualitative study conducted by Flannery, Pecheux and Lappin.

FIGURE 11: IMPORTANCE RATINGS

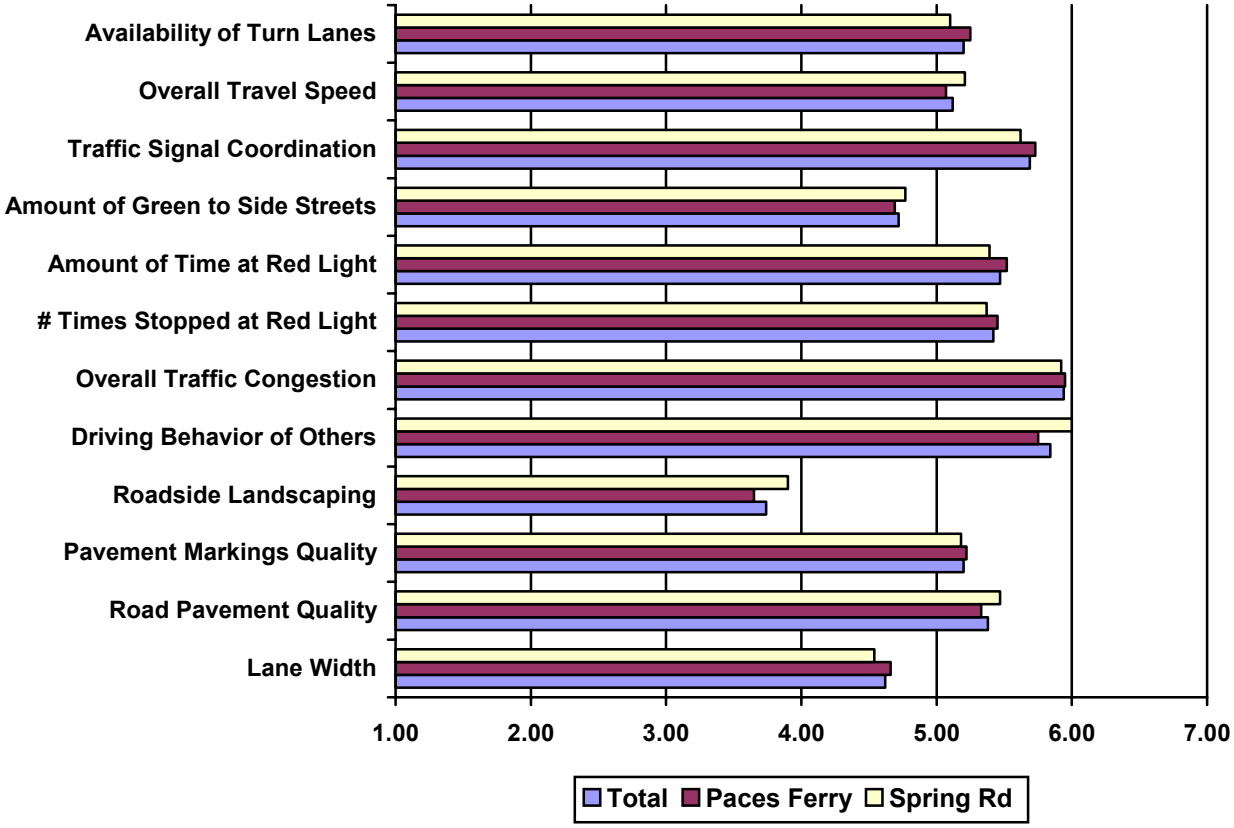


Table 6 shows the satisfaction ratings, recorded after each driver made the wave 1 scheduled drive. Again, the Spring Road and Paces Ferry drivers rated the attributes similarly. Road Pavement Quality, Lane Width, and Pavement Marking Quality received the highest ratings. The Number of Times Stopped by Red Lights, Amount of Time at Red Lights, and Driving Behavior of Others received the lowest ratings. Despite overall similarities, there were some statistically significant differences between the two driver groups. Paces Ferry drivers gave higher ratings to Road Pavement Quality, Driving Behavior of Others, Overall Level of Traffic Congestion, and Overall Travel Speed.

These findings are perhaps related to differences in actual conditions. In particular, the recent repaving of the section of Paces Ferry Road near the interstate exchange would explain why Paces Ferry drivers are more satisfied with Road Pavement Quality. Moreover, Spring Road drivers' lower satisfaction rating for Driving Behavior of Others is not surprising given their greater concern for this aspect of their driving experience (as reflected in the greater importance Spring Road drivers assigned to this factor relative to Paces Ferry drivers).

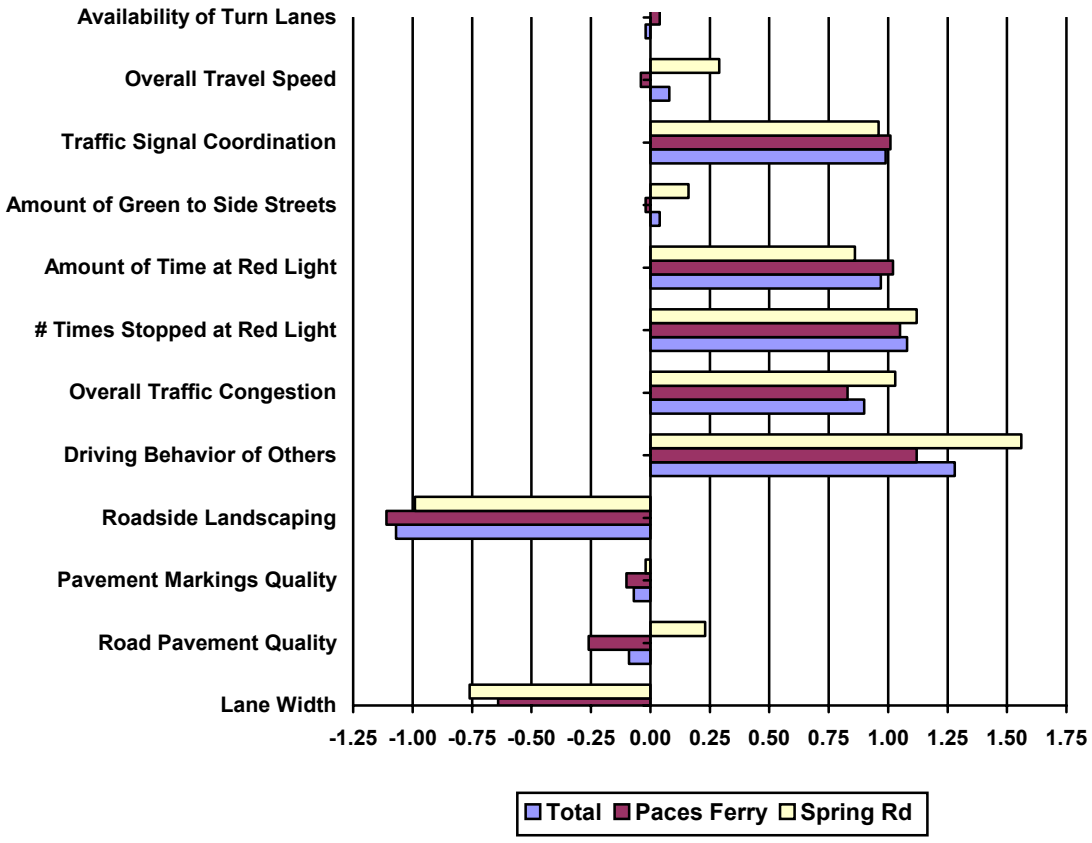
Table 6: Wave 1 Driver Satisfaction Ratings

(Mean scores)

Attribute	Wave 1	
	Paces Ferry	Spring
Road Pavement Quality	**5.60**	5.25
Pavement Marking Quality	5.31	5.19
Lane Width	5.30	5.30
Availability of Turn Lanes	5.21	5.23
Traffic Congestion	**5.12**	4.89
Overall Travel Speed	**5.11**	4.92
Roadside Landscaping	4.76	4.89
Traffic Signal Coordination	4.72	4.66
Green Time for Side Streets	4.71	4.61
Driving Behavior of Others	**4.63**	4.44
Time at Red Lights	4.49	4.53
# Times Stopped by Red Light	4.40	4.25

Figure 12 shows the "gap" between the importance and wave 1 satisfaction ratings. The value shown is the difference between the importance rating and the satisfaction rating. A value of zero means that the driver's satisfaction with the attribute is equal to its importance to them. A positive value means that the drivers felt that the attribute was important, but were not as satisfied with it (i.e., there is room for improvement in satisfaction). A negative value means that the drivers were very satisfied with the attribute and it received a higher rating than its importance to the driver.
Based on these differences, the survey showed that Roadside Landscaping is not very important to the drivers, but they are very satisfied with what they see. Lane Width is also not important, but drivers are satisfied with it. Driving Behavior of Others is important to these drivers, but they are not very satisfied with it. Similarly, the Number of Times Stopped at a Red Light is important, but they are not very satisfied with it. Amount of Time at Red Lights, Overall Travel Speed and Traffic Signal Coordination fall into this category as well.

FIGURE 12: GAP BETWEEN IMPORTANCE AND WAVE 1 SATISFACTION RATINGS



NOTE: For both the importance ratings question and the satisfaction ratings question, Respondents were asked to rate each attribute using a seven-point scale.

For the wave 2 drive, again Paces Ferry and Spring Road drivers rated the attributes similarly. As with the wave 1 survey, Road Pavement Quality, Lane Width, and Pavement Marking Quality received the highest ratings. The Number of Times Stopped By Red Lights, Amount of Time at Red Lights, and Driving Behavior of Others received the lowest ratings (which were the same attributes receiving the lowest ratings in wave 1). The only differences between the two samples mirrored those found in wave 1, where Paces Ferry drivers were more satisfied with Road Pavement Quality, Driving Behavior of Others, and Overall Level of Traffic Congestion. In wave 2, Spring Road drivers were more satisfied with Roadside Landscaping. Given the greater importance of Roadside Landscaping to Spring Road drivers, their satisfaction ratings may be more sensitive to the seasonal changes in the landscaping.

One of the objectives of the study was to measure the change in satisfaction levels after an adaptive traffic signal system is installed. Table 7 shows the mean satisfaction rating

with each attribute for Paces Ferry drivers, as well as the net difference in ratings (wave 2 minus wave 1). Overall, satisfaction ratings were similar across the two waves; the only statistically significant differences were increased satisfaction with Lane Width and Roadside Landscaping. The latter can easily be explained by the seasonal variation in when the interviews were conducted; whereas wave 1 was administered in the late fall, wave 2 was administered in the spring, when the landscaping was more attractive.

For many of the roadway attributes, the difference in ratings between wave 1 and wave 2 were relatively small (less than one percent difference). Though not statistically significant, it is worth noting that the decreased satisfaction found for Number of Times Stopped at Red Light and Traffic Signal Coordination was relatively larger than that found for other roadway attributes.

TABLE 7: CHANGE IN DRIVER SATISFACTION – PACES FERRY

Attribute	Wave 1		Wave 2		Difference	% Difference
	Mean	SE Mean	Mean	SE Mean		
Lane Width	5.30	0.07	5.48	0.07	0.18	3.4%
Road Pavement Quality	5.60	0.06	5.59	0.06	-0.01	-0.2%
Pavement Marking Quality	5.31	0.07	5.30	0.07	-0.01	-0.2%
Roadside Landscaping	4.76	0.07	5.04	0.07	0.28	5.9%
Driving Behavior of Others	4.63	0.08	4.64	0.07	0.01	0.2%
Traffic Congestion	5.12	0.08	5.02	0.07	-0.10	-2.0%
# Times Stopped by Red Light	4.40	0.09	4.26	0.08	-0.14	-3.2%
Time at Red Lights	4.49	0.09	4.38	0.08	-0.11	-0.4%
Green Time for Side Streets	4.71	0.08	4.68	0.07	-0.03	-0.6%
Traffic Signal Coordination	4.72	0.09	4.57	0.08	-0.15	-3.2%
Overall Travel Speed	5.11	0.07	5.07	0.07	-0.03	-0.8%
Availability of Turn Lanes	5.21	0.08	5.20	0.08	-0.01	-0.2%
Overall	5.11	0.07	5.14	0.06	0.03	0.6%

Table 8 presents wave 1 and wave 2 ratings for Spring Road drivers. Similar to findings for Paces Ferry Road, there was a significant increase in satisfaction for Roadside Landscaping. This was the only attribute whose overall satisfaction level changed statistically from wave 1 to wave 2. For Spring Road drivers, net satisfaction levels for Roadside Landscaping increased by 12%, a finding easily explained by the seasonal difference in survey administration. As originally hypothesized, then, drivers on the control route rated the roadway attributes similarly across both waves.

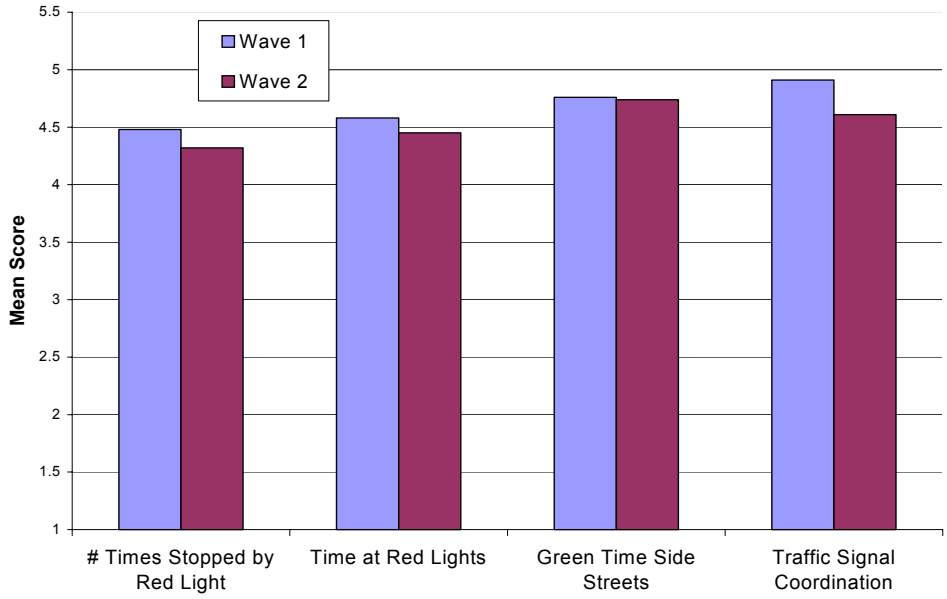
TABLE 8: CHANGE IN DRIVER SATISFACTION – SPRING ROAD

Attribute	Wave 1		Wave 2		Difference	% Difference
	Mean	SE Mean	Mean	SE Mean		
Lane Width	5.30	0.09	5.41	0.09	0.11	2.1%
Road Pavement Quality	5.25	0.09	5.22	0.09	-0.03	-0.6%
Pavement Marking Quality	5.19	0.09	5.30	0.09	0.10	2.1%
Roadside Landscaping	4.89	0.10	5.48	0.09	0.59	12.1%
Driving Behavior of Others	4.44	0.11	4.35	0.10	-0.09	-2.0%
Traffic Congestion	4.89	0.11	4.80	0.10	-0.10	-1.8%
# Times Stopped by Red Light	4.25	0.12	4.30	0.11	0.06	1.2%
Time at Red Lights	4.53	0.11	4.56	0.10	0.04	0.7%
Green Time for Side Streets	4.61	0.10	4.62	0.10	0.01	0.2%
Traffic Signal Coordination	4.66	0.11	4.76	0.11	0.09	2.1%
Overall Travel Speed	4.92	0.09	5.01	0.09	0.09	1.8%
Availability of Turn Lanes	5.23	0.09	5.32	0.09	0.09	1.7%
Overall	5.01	0.08	5.10	0.08	0.08	1.8%

As detailed in the introductory section to this report, the study was structured to measure changes in driver satisfaction based on the installation of an adaptive signal system control. The null hypothesis was that there would be no change in satisfaction and the results suggest that for Paces Ferry and Spring drivers as a whole, there was no statistical change in driver satisfaction, resulting in the acceptance of the null hypothesis.

Despite the null findings, analysis was undertaken to investigate changes in satisfaction by time of drive, as it was originally anticipated that off-peak drivers would be more likely to experience an improvement in their drive. In particular, this analysis focused on the key roadway factors related to adaptive traffic signal systems (including Number of Times Stopped by a Red Light, Amount of Time at a Red Light, Amount of Green Time to Side Streets, and Traffic Signal Coordination). Contrary to expectations, off-peak drivers were *less* satisfied with Traffic Signal Coordination in wave 2 (compared to wave 1), though there was no significant change on the other three measures of interest (see Figure 13).

FIGURE 13: CHANGE IN SATISFACTION AMONG OFF-PEAK DRIVERS



For peak drivers there was no statistically significant change in satisfaction for Number of Times Stopped at a Red Light, Time at Red Lights, Green Time for Side Streets, or Traffic Signal Coordination.

Why Was There No Change in Driver Satisfaction?

In order to better understand the survey findings, the evaluation team considered potential factors that might explain why there was no change in driver satisfaction on Paces Ferry Road. One possibility is that the lack of change in driver satisfaction might be due to a change in the drive conditions or driver constraints. Several characteristics of the drive were measured in both the wave 1 and wave 2 driver surveys, including level of traffic congestion (relative to normal), concern about on-time arrival, and degree of schedule flexibility. So, for example, it is possible to determine if drivers were experiencing greater traffic congestion in wave 2 versus wave 1, or if they were more concerned about on-time arrival. Changes in these measures might affect their satisfaction ratings. However, these measures were fairly consistent across both waves of the study, and there were no significant changes in schedule constraints or reported levels of traffic congestion. In other words, these factors should not explain why drivers were not more satisfied.

In addition, in each wave of the study, drivers were also asked if their scheduled drive on Paces Ferry Road had been "typical" or not. In order to rule out the possibility that

respondents with "atypical" drives had skewed the overall satisfaction ratings, the wave 1 and wave 2 satisfaction ratings were compared only among those drivers who said their drive was *typical*[7]. However, the findings from this analysis replicated the overall study findings. That is, among those who reported having typical drives, the only significant change in satisfaction across the two waves was for "Lane Width" and "Roadside Landscaping."

TABLE 9: CHANGE IN DRIVER SATISFACTION ON PACES FERRY

(AMONG DRIVERS WHO SAID THEIR DRIVE WAS TYPICAL)

Attribute	Wave 1		Wave 2		Difference	% Difference
	Mean	SE Mean	Mean	SE Mean		
Lane Width	5.30	0.08	5.49	0.08	0.19	3.6%
Road Pavement Quality	5.64	0.07	5.61	0.07	-0.03	-0.6%
Pavement Marking Quality	5.34	0.08	5.30	0.08	-0.04	-0.7%
Roadside Landscaping	4.70	0.09	5.06	0.08	0.36	7.6%
Driving Behavior of Others	4.58	0.09	4.55	0.08	-0.03	-0.6%
Traffic Congestion	4.97	0.09	4.98	0.08	0.01	0.2%
# Times Stopped by Red Light	4.35	0.10	4.24	0.09	-0.11	-2.5%
Time at Red Lights	4.44	0.10	4.37	0.09	-0.07	-1.6%
Green Time for Side Streets	4.68	0.09	4.66	0.08	-0.02	-0.4%
Traffic Signal Coordination	4.69	0.10	4.58	0.09	-0.11	-2.3%
Overall Travel Speed	5.07	0.08	5.06	0.07	-0.01	-0.2%
Availability of Turn Lanes	5.19	0.09	5.19	0.09	0	0
Overall	5.06	0.08	5.13	0.07	0.07	1.4%

Another possibility is that SCATS did not result in significant improvement to roadway travel times or in a significant reduction in delay. An independent evaluation conducted by the Georgia Institute of Technology to assess the effects of the adaptive signal system on travel time and delay lends support to this hypothesis. Both before and after installation of the adaptive signal system control, Measures of Effectiveness (MOEs) including travel time, speed, and delay were captured. Delays were calculated at several locations along the corridor using queue length studies for side street traffic and main street turning movements and throughout the corridor using probe vehicle data. The data were collected during peak and off-peak hours (on weekdays and weekends) over a 4-week period for wave 1, and over a 5-week period for wave 2. Standard test vehicle techniques were used to conduct end-to-end runs, as well as randomized test runs through the network. Overall, there were more than 700 wave 1 and 900 wave 2 end-to-end test runs, and there were approximately 450 wave 1 and 750 wave 2 randomized test runs.

[7] In wave 1, 88 drivers on Paces Ferry reported that their drive was not typical, and in wave 2, 65 drivers reported that their drive was not typical.

At an aggregate level the results from the Georgia Institute of Technology study do not indicate considerable differences in travel times, speeds, or delays. A more detailed analysis of each studied time period highlighted some performance differences along different sections of the arterial although neither the before or after signal timing system consistently provided superior performance. As stated earlier, one expectation of the Cobb County Department of Transportation was that off-peak periods should show measurable performance improvements. The evaluation found neither the before or after signal control schemes demonstrated consistently superior off-peak performance. Another area of major interest was the performance of intersections adjacent the railroad crossing, although again neither system was seen to be superior. During the after evaluation period it was noted that some difficulties existed with the flush plan developed for clearing vehicles after the train completed its crossing, and along the corridor there were some difficulties with several vehicle detectors.

It was determined that, with the exception of one or two intersections, both the semi-actuated coordinated system (i.e., "before" pre-adaptive installation) and adaptive ("after" system) could be fairly categorized as well timed systems, both providing a high level of service. For example, during the weekday off-peak average probe vehicle speeds over several arterial sections exceeded the posted speed limit and the probe vehicle based mainline through movement delay for numerous intersections was less than 10 seconds/vehicle for both before and after conditions. Arguably, initial analysis of the "before" operation indicated that there existed minimal opportunity for significant improvement.

Factors Related to Driver Satisfaction

In addition to addressing the question of whether there was a change in driver satisfaction due to the adaptive timing signal system, the driver data collected in Cobb County offers the opportunity to explore the extent to which different factors (such as trip purpose and time of drive) are related to driver satisfaction.

Not surprisingly, the time of day of the drive is significantly related to a number of the driver satisfaction items measured in the survey. In both waves of the study, the decreased congestion experienced during off-peak times was reflected in the driver satisfaction ratings. As Table 10 illustrates, off-peak drivers reported higher levels of satisfaction for Driving Behavior of Others, Traffic Congestion, Number of Times Stopped by a Red Light, Time at Red Lights, Green Time for Side Streets, Traffic Signal Coordination, Overall Travel Speed, and Availability of Turn Lanes. Overall driver satisfaction was also higher among off-peak drivers compared to peak drivers (5.26 vs. 4.70 in wave 1 and 5.24 vs. 4.89 in wave 2). However, for measures related to infrastructure, such as Road Pavement Quality, Lane Width, and Pavement Marking Quality, there were no statistical differences by peak versus off-peak drivers. This finding is expected, as satisfaction with these infrastructure items should not vary by time of day.

Personal schedule constraints were also related to driver satisfaction. Compared to drivers who were concerned about arriving on time, those who had no such schedule

constraints were more likely to be satisfied overall, and also were more satisfied in their ratings of Traffic Congestion, Overall Travel Speed, and the measures related to Traffic Signal Coordination. When trip purpose was analyzed, however, there was no consistent, significant relationship between trip purpose and the individual driver satisfaction measures.

TABLE 10: FACTORS RELATED TO DRIVER SATISFACTION

(WAVE 1 MEAN SCORES)

Attribute	Time of drive		Concern about on-time arrival		
	Off-Peak	Peak	Not concerned	Somewhat concerned	Very Concerned
Lane Width	5.33	5.25	5.39	5.22	5.25
Road Pavement Quality	5.47	5.47	5.5	5.43	5.52
Pavement Marking Quality	5.27	5.26	5.3	5.25	5.25
Roadside Landscaping	4.79	4.83	4.81	4.73	4.99
Driving Behavior of Others	4.67	4.34	4.6	4.40	4.59
Traffic Congestion	5.27	4.57	5.29	4.79	4.85
# Times Stopped by Red Light	4.47	4.10	4.49	4.22	4.16
Time at Red Lights	4.63	4.26	4.72	4.35	4.25
Green Time for Side Streets	4.74	4.55	4.84	4.56	4.44
Traffic Signal Coordination	4.86	4.39	4.86	4.55	4.58
Overall Travel Speed	5.22	4.69	5.29	4.84	4.78
Availability of Turn Lanes	5.31	5.04	5.37	5.10	5.07
Overall	5.26	4.70	5.39	4.84	4.70

A key characteristic of the treatment route was the presence of railroad tracks on the eastern end of the route. The Cobb County DOT was aware that this was a source of dissatisfaction among drivers of the route, and indeed the data bear this out. In both waves of the study, drivers who crossed the railroad tracks had lower satisfaction ratings, compared to those who did not cross the railroad tracks as part of their trip. While not surprising, these findings attest to the reliability of the method in capturing differences in drivers' perceptions based on differences in roadway conditions.

TABLE 11: RELATIONSHIP BETWEEN DRIVER SATISFACTION AND CROSSING THE RAILROAD TRACKS

(WAVE 1 MEAN SCORES)

	Respondent Crosses Railroad Tracks	Respondent Does Not Cross Railroad Tracks
Lane Width	5.16	5.50
Road Pavement Quality	5.50	5.76
Pavement Marking Quality	5.22	5.48
Roadside Landscaping	4.92	4.59
Driving Behavior of Others	4.61	4.71
Traffic Congestion	5.02	5.28
# Times Stopped by Red Light	4.31	4.61
Time at Red Lights	4.35	4.70
Green Time for Side Streets	4.66	4.88
Traffic Signal Coordination	4.60	4.93
Overall Travel Speed	5.06	5.21
Availability of Turn Lanes	4.87	5.61
Overall	4.94	5.33

Assessing the Performance of the Methodology

The study findings lend support to the conclusion that the developed methodology is robust. First of all, Response rates were good and similar to those obtained in other transportation studies. Fully one-half of eligible respondents agreed to help with the study, and of these 63% actually completed the survey. Moreover nearly three-quarters of wave one respondents also completed wave two (71%). Secondly, ratings were consistent with observable roadway conditions. Several examples include:

1. Both Paces Ferry and Spring Road drivers experienced a significant increase in satisfaction for "Roadside Landscaping" reflecting the seasonal difference between wave 1 and wave 2. Wave 1 of the study was conducted in late fall and early winter, whereas wave 2 was conducted in the late spring, when landscaping in that region is particularly attractive.
2. On Paces Ferry Road, respondents who crossed the railroad tracks were significantly less satisfied with regard to their driving experience, compared to drivers who did not have to cross the railroad tracks.
3. Compared to peak drivers, off-peak drivers registered higher levels of satisfaction with measures related to traffic congestion or traffic flow, presumably due to the fact that there is less traffic congestion during off-peak hours. However, on items related to infrastructure (i.e., road pavement quality), there was no statistical difference between off-peak and peak drivers.

4. As anticipated, there was no significant independent change in satisfaction for Spring Road drivers (with the understandable exception of the Roadside landscaping item). Given there were no changes to the control route, one would not expect to find a significant change in the satisfaction measures.

In addition, differences between the two samples of drivers were consistent across both waves of the study. In wave 1, Paces Ferry drivers expressed greater satisfaction on specific roadway factors, including Road Pavement Quality, Driving Behavior of Others, Overall Level of Traffic Congestion, and Overall Travel Speed. In wave 2, Paces Ferry drivers again registered higher levels of satisfaction with Road Pavement Quality, Driving Behavior of Others, and Overall Level of Traffic Congestion.

Finally, it is important to note that this method and the Georgia Institute of Technology study independently drew similar performance conclusion. As described previously in this report, the Georgia Institute of Technology conducted both a before and after study, using standard floating car techniques to measure travel time, speed and delay.

IV Lessons Learned Regarding Study Approach

Through the course of developing the study approach and administering the driver surveys, a number of "lessons learned" were documented regarding the study design and methodology. This section of the paper highlights key issues that evaluators will need to consider when designing similar driver evaluations.

Controlling For External Explanatory Factors

With a pre-post study, measurements are taken before and after a particular treatment, and if properly designed, the objective is to be able to attribute any change in the measurements to the treatment. In Cobb County, the treatment was the adaptive timing signal system, and the objective was to test whether driver satisfaction increased as a result of the deployment of the adaptive signal system control.

A key challenge in pre-post studies of this type is controlling for outside factors that may provide alternative explanations for why there was a change in satisfaction. For example, if there were infrastructure improvements made to the treatment route during the study period -- in addition to the deployment of the adaptive signal system control -- then it would be unclear whether any resulting improvement in driver satisfaction was due to the infrastructure improvements or the adaptive signal system control.

The advantage of a lab setting is that the researcher can control the environment, and so can more reliably attribute changes in measurements to the treatment. But a drawback to lab experiments is the artificiality of the setting. For experimental studies conducted 'in the field' (such as the Cobb County study), the authenticity of the real world setting comes with a price; it is impossible to control all the environmental factors that might affect drivers' satisfaction ratings. However, to the extent that it is possible, alternative explanations that would impact the study findings must be identified and controlled for. Researchers need to consider the following issues:

- Seasons: Are both waves of the study conducted during similar seasons, when weather conditions are relatively comparable?
- Traffic incidents/severe weather: Is there a system in place for monitoring instances of severe weather or traffic incidents? Since traffic incidents or severe weather can affect driver satisfaction ratings, drives conducted under such conditions should not be included in the data. It is important to be able to identify such cases and to reschedule the drives for a later date.
- Characteristics of the individual trip: During both waves of the study are the trips conducted at the same time of day and for the same trip purpose? Key characteristics of the trip should remain constant across both waves of the study, given that there tend to be differences in driver satisfaction depending on the time of the drive (peak vs. off-peak) and whether it is a time-constrained trip. If a driver made her wave 1 drive during peak hours, but the wave 2 trip was made during off-peak hours, it would not be possible to determine whether

an increase in satisfaction was due to the adaptive traffic signal system or to the change in traffic conditions in wave 1 vs. wave 2.

- Infrastructure changes along the route: During the study period, is the deployment the only change that will occur along the route? If there are additional infrastructure improvements during the same period, it will be difficult to isolate the effects of the ITS enhancement. The evaluator will need to discuss this issue with the local Department of Transportation.
- Traffic counts: If traffic counts can be measured during both waves of the study, then it will be possible to rule out the possibility that a change in traffic volume was the cause of a change in satisfaction. In the Cobb County study, traffic counts were not available; however, there were no openings or closings of residential or commercial developments during the 8-month study period, so there was no reason to believe that traffic volumes would change significantly.

In addition, there may be factors that can be controlled for in the survey instrument. For example, the respondent might be asked to rate the level of traffic congestion during both waves of the study, so it is possible to determine if the respondent experienced similar levels of traffic congestion. In the Cobb County study, both waves of the survey asked respondents whether or not conditions during their drive were typical, and questions on trip flexibility and concern with on-time arrival were also included so that any changes in these factors could be considered in the analysis of driver satisfaction ratings.

Target Population and Eligibility Requirements

When evaluating a particular facility, one of the first questions that need to be addressed is "who will comprise the study population?" The response to this question will be determined by the study objectives, and so needs to be addressed separately for each evaluation. In the case of the Cobb County driver satisfaction study, the objective was to determine whether drivers notice a difference in roadway performance due to the deployment of an adaptive timing signal system. Given this objective, a key criterion for eligibility was that the study participants should be regular users of the transportation facility. In this way, they are familiar with the normal, day-to-day operation of the facility and they have some basis by which they can judge performance. For other ITS deployments, it may not be necessary to target "regular" users of the facility. For example, if the research question is whether variable message signs (VMS) have any influence on driver behavior, the target population can be any driver who saw the VMS; there is no compelling reason (given the research question of interest) to limit the sample to "regular users" of the route.

Another key question pertains to whether or not respondents are required to drive the entire route in order to be eligible for participation. In Cobb County, Interstate 285 bisects the treatment route and is a natural entry and exit point for drivers. Indeed, recruitment revealed that many respondents were driving approximately half the route, either entering or exiting at Interstate 285. Limiting the sample to those who drove the entire route would have incurred significant additional cost. In making a decision on

appropriate eligibility requirements, evaluators will need to develop a reasonable estimate (with input from the local DOT) of the minimum number of traffic signals that drivers will need to cross in order to notice an effect of the adaptive system.

There are also practical eligibility requirements that need to be considered. For example, in the Cobb County study, respondents had to have a valid driver's license, the household had to own at least one vehicle, and the respondent could not be employed by Cobb County DOT, Georgia DOT or U.S. DOT. Age restrictions were also set. Future evaluations should consider the inclusion of these (or similar) eligibility criteria, and will need to assess whether additional eligibility requirements are necessary given the study objectives.

With panel studies, it is important to note that eligibility must be re-established prior to each successive wave of the study. Careful consideration needs to be given to the criteria used for re-establishing eligibility; while certain changes in trip characteristics from wave 1 to wave 2 may be acceptable, other changes will result in the respondent no longer being eligible to participate. As a rule, if the respondent's trip characteristics have changed in a way that may be related to their satisfaction ratings, then that respondent should no longer be eligible. In the Cobb County study, for example, a respondent who completed their wave 1 drive during peak hours was only eligible to participate in wave 2 if they were still regularly driving on the route during peak hours. If that driver had switched to driving the route during off-peak hours, he or she would become ineligible, as it was hypothesized that the time of the drive is related to driver satisfaction. While the goal is to retain as many wave 1 respondents as possible, a careful assessment of eligibility is required to insure that the objectives of the study are being met.

Sample Design

An important study design question involves the design of the sample. In order to draw reliable conclusions about driver satisfaction with roadway performance, a representative sample should be drawn. By employing representative sampling techniques, the sample that is collected will reflect the larger population of drivers on the route, thus making it possible to generalize from the sample findings.

A key question that needs to be resolved at the outset is how will the sample be collected? In Cobb County, it made sense to sample by geographic area, since it was possible to obtain a residential telephone sample for census tracts near the study route(s). While this sampling strategy was appropriate for the Cobb County study, where it was necessary to identify regular users of the roadway, it may not be the best approach for a different transportation facility or for a different target population. For example, if conducting an evaluation of satisfaction with variable message signs on a highway, one would want to consider the opinions of through-travelers as well as residents who regularly drive on the highway. In this case, a more creative sampling strategy might be needed, such as randomly intercepting drivers at a nearby rest stop.

There are additional factors that evaluators will want to consider in developing the sampling strategy. These include:

- Will the sample be distributed evenly across all days of the week?
- How will the sample be distributed by time of day? [8]

Sampling strategies may need to be adjusted depending on the ITS enhancement being evaluated and the particular objectives of the study. In Cobb County, off-peak drivers were over-sampled since it was expected that the benefits of the system would be greatest during off-peak traffic conditions. On the other hand, if a study were being designed to evaluate driver satisfaction with a variable message sign installed on a highway facility, evaluators might consider oversampling drivers who are on the highway during peak traffic times, when the VMS is most likely to be in use.

Likewise, the characteristics of the particular test site, if they are related to the study hypotheses, will have an impact on sampling strategies. For example, if there is a school on the study route, and one of the hypotheses of the study is that the adaptive traffic signal system being installed will alleviate traffic congestion at the beginning and at the end of the school day, the study design should oversample drivers who are on the road during those hours of the day.

Sample Size

Careful consideration needs to be given to what sample size is necessary to meet the data requirements of the study. If random sampling techniques are being used, decisions on sample size will depend on how large a shift (from pre to post) you want your test to be able to detect, as well as how powerful a test is required. With larger samples, the power of the test increases. For most evaluations, a minimum sample size of 300-400 should be sufficient. However, if detailed subgroup analysis is a primary objective of the study, larger samples may be necessary.

In addition, with panel studies, the evaluation team will need to develop realistic estimates of their ability to retain respondents across both waves of the study. In the Cobb County study, the survey research firm estimated that it would need to recruit approximately 800 respondents to achieve the desired goal of 400 completed surveys (at the end of wave 2). To obtain this estimate, the survey research firm assumed that 80% of recruited respondents would actually complete wave 1 (for a sample of 640). Of these, it was estimated that 500 would be re-recruited for wave 2 and that 80% of these would actually complete the wave 2 survey task, resulting in a final sample size of 400.

[8] The definition for peak and off-peak may vary across different test sites. The local Department of Transportation should be consulted when establishing the parameters for peak vs. off-peak hours.

Survey Design

The driver survey needs to be carefully designed in order to balance two oftentimes competing aims: collecting the required data and maintaining a reasonable number of questions. If the survey is too long, drivers may choose not to complete it. For the Cobb County survey, the evaluation team determined that it would collect the necessary data using three different forms – the recruitment screener, the background information form and the driver survey. This format worked well for a number of reasons. First, the recruitment screen was used to determine eligibility and to collect demographic information, so that demographic questions would not need to be asked in the background or driver surveys. Second, it enabled the evaluation team to separate the task of obtaining information about the respondent's usual driving experience on the route (background survey), from the task of obtaining information about their specific experience on the day of their scheduled drive (driver survey). Using only one survey form would have required drivers to think about both their usual and their specific driving experience at the same time, perhaps resulting in confusion or survey measurement error. Separating the tasks, however, increased our confidence that we would be collecting reliable data. Moreover, since each of the surveys was only one page in length, the task was not too burdensome for respondents.

For the background survey, consideration should be given to measuring the following general characteristics of the trip:

- Trip purpose
- Trip length
- Trip flexibility
- Type of vehicle
- General driving habits

The key focus of the driver survey is the collection of the driver satisfaction ratings. Careful consideration needs to be given to the specific list of roadway factors that will be evaluated. The set of roadway factors used in the Cobb County study provides a good starting point; however, depending on the characteristics of the specific roadway being tested, as well as the specific ITS enhancement that is being evaluated, items may be added (or deleted) as necessary. The qualitative work conducted by Pecheux, Flannery and Lappin provides a comprehensive list of roadway factors that drivers in four different cities across the United States described as important.[9]

In addition, the evaluators will need to consider the types of factors related to driver satisfaction that they will want to track across both waves of the study. In this way, it is possible to determine if there are changes in these factors that might explain changes in the satisfaction ratings. For example, in both waves of the Cobb County study, drivers were asked about their trip flexibility, their concern with on-time arrival, the number of people in the car, and activities performed while driving (i.e., eating, using cell phone

[9] Please refer to *Quality of Service and Customer Satisfaction on Urban Arterials: Final Report*.

etc.) in order to measure the consistency in these factors. In addition, drivers were asked if the drive was typical compared to when they usually make the drive (if no, how was it different) and how the level of traffic congestion compared to their typical experience.

In the driver survey, respondents were also asked to rate the three roadway attributes that were most important to them while making their drive and the three attributes that were least important (from the same list of factors used in the satisfaction question). This formatting of the question proved less useful than anticipated. Given that respondents were asked to rate the importance of the roadway attributes on a seven-point scale in the background survey, it would have been useful to have the same seven-point scale in the driver survey, so that direct comparisons between the two would be possible. While the evaluation team had considered using a seven-point scale for the importance question in the driver survey, it did not want to risk any confusion on the part of the respondent between the measure of importance and the measure of satisfaction. Future studies should use the pilot study to test whether respondents can successfully distinguish between the satisfaction and the importance question when the same scale is used for each in the same survey.

Finally, the driver survey should include a "comment box" at the end of the survey, where respondents can register any additional comments or feedback regarding their driving experience. This may provide some useful insights to their survey responses, and at the very least the local DOT will find the data informative.

Data Collection Procedures

Rigorous data collection procedures were used in the Cobb County driver satisfaction study in order to achieve the highest possible response rates. As previously stated, high response rates increase confidence that the sample findings are indeed representative of the large population of drivers on the route. With panel studies, minimizing panel attrition over the course of the study is of particular importance, as the evaluation team wants to insure that any measurement changes from wave 1 to wave 2 are not due to panel attrition. While it is unavoidable that some respondents will drop out after the first wave of the study, rigorous data collection procedures can minimize panel attrition.

The various measures that were used to increase response rates and to insure the collection of reliable data are detailed below:

- Pilot test: The pilot test provides useful feedback on the survey instrument as well as the data collection procedures. It enables the survey research team to test the different stages of the study design, such as driver recruitment and driver reminders, and the respondent debriefing gives participants the opportunity to comment on all aspects of the study.
- Advance letter and brochure: These survey materials serve several purposes. If designed in a professional manner and are clearly written and easy to understand, they convey to the respondent the importance and the legitimacy of the study.

Respondents who have received these materials may be less likely to hang up when they receive the recruitment call from the survey research firm.

- Incentives: For the Cobb County study, each respondent who completed both waves of the study received $17 ($5 for wave 1, $2 in between the two waves and $10 at the start of wave 2). Incentives are an effective way of establishing a reciprocal relationship with the respondent, and at the margins, can increase the likelihood of participation. For panel studies they are particularly important – not only at obtaining cooperation at the first stage, but in maintaining respondent participation through the course of the study.
- Reminder calls/emails: Reminders are an easy, effective tool for increasing the likelihood of participation. Many respondents have extremely busy, hectic schedules and a simple reminder highlights a task that otherwise might have been forgotten and so increases the likelihood that the task will be completed. At the same time, the reminder conveys the importance of the study and the value that the research firm places on the respondents' participation.
- Panel Maintenance letter: In between the two waves, a panel maintenance letter should be used to thank respondents for their participation in wave 1 and to notify them of the upcoming wave 2. Maintaining contact with the respondent is important to minimizing panel attrition.
- Minimal time lag between the two waves: The timing of the two waves of the panel study is contingent on the deployment of the ITS. To the extent that it is possible, however, every effort must be made to minimize the time between the two waves, as panel attrition tends to increase over time (i.e., there is a greater likelihood that respondents will move, change their driving patterns, or lose interest in participating in the study).
- Use of multiple data retrieval channels: Respondents will differ in how they prefer to send in their data. While some respondents are happy to mail back their questionnaires, others may want to complete and submit the survey online. To the extent that the study can accommodate these different preferences, respondents will be more likely to participate in the study.

- Careful monitoring of each respondent's progress, with follow-up as necessary: The survey research firm should closely monitor each respondent's progress through the course of the study. If a respondent's survey is not received within the expected time frame, the research firm must follow-up with the respondent to determine if the survey is "in the mail," or if the drive needs to be rescheduled. Likewise the survey research firm has to review the survey responses regarding drive conditions to determine if there were any unusual events (i.e., traffic incident or severe weather) that might warrant a rescheduling of the drive. Again, these procedures are part of the overall effort to obtain reliable data and to maximize response rates.

- Careful monitoring of respondents' survey comments during the course of the survey: As the surveys are returned and data entry begins, the survey firm should

review open-ended comments made by the drivers to determine if there are any peculiar events or issues that require clarification or follow-up.

Coordination and Scheduling

This type of panel study – one that is designed to measure the effects of a particular treatment (in this case an adaptive timing signal system) is particularly challenging in that the timing of the driver surveys hinges entirely on the schedule for the deployment. Any delay in the installation of the adaptive signal system control necessarily results in a delay regarding survey administration, and depending on the magnitude of the delay, could result in significant panel attrition. Consequently, experimental pre-post studies require particular attention to scheduling and a high level of coordination with the local DOT. Establishing frequent communication with the local DOT regarding the project's progress (especially any changes to the schedule) is critical.

Given the importance of timing and scheduling for this type of project, site selection is of utmost importance. At the outset of the project, the evaluation team needs to be sure that the test site under consideration has adequate funding and is "ready to go."

Supplementing Subjective Measures with Objective Measures

One of the key strengths of the Cobb County study was that subjective measures from the drivers (Volpe evaluation) and objective measures of roadway performance (Georgia Institute of Technology evaluation) were collected during the same time period before and after installation of the adaptive timing signal system. Comparisons between the Volpe driver ratings and the findings from the Georgia Institute of Technology can only be made at an aggregate level, as these are separate datasets. Nonetheless, the two datasets were collected during the same time period and so a comparison is still instructive. The fact that both evaluations drew similar conclusions strengthens our confidence in the overall findings.

An alternative approach would be to simultaneously collect both subjective (survey) and objective measures. For example, the respondents participating in a driver evaluation would have their vehicles equipped with GPS, so that objective measures could be collected for each vehicle. In this way, changes in driver ratings could be matched directly to changes in objective roadway performance measures, providing a robust dataset for analysis. From a theoretical perspective, this study design would be ideal, however, the costs of such a study would be significant, and research suggests that there may be bias in such a sample.[10]

[10] In an analysis of the Kansas City Regional Travel Survey, Bricka found that study participants who agreed to have GPS installed in their vehicles differed from respondents who did not agree to have GPS installed. The GPS participants were more likely to be higher income, to own more than one vehicle, and to live in single-family homes.

To the extent that future studies can combine both subjective and objective measures of performance, a richer understanding of the effects of the ITS deployment will be obtained.

V Conclusions

The findings from the Volpe driver satisfaction study and the Georgia Institute of Technology converge, indicating that in fact there was no observable improvement in roadway performance due to the adaptive timing signal system. Given the lack of improvement in the objective measures captured by the Georgia Institute of Technology, it is not surprising that there was no increase in satisfaction among drivers. A likely reason for the null findings is that the corridor was already performing at an optimal level with respect to traffic signal coordination under the initial signal timings. The corridor had been recently re-timed, and Cobb County Department of Transportation continually adjusts the signal timing on its corridors, based on complaints received from drivers.

Overall, these results indicate that for roadway types similar to the one evaluated in this study, the SCATS adaptive signal system control may not increase drivers' day-to-day satisfaction with their roadway experience if the corridor is already optimally timed. It may be the case, however, that drivers notice an improvement in their roadway experience (due to the adaptive signal system control) during non-recurring traffic conditions. Or it may be that adaptive traffic signal systems provide long term cost benefits, as they may be less expensive to deploy and maintain over time (compared to fixed signal timing systems). Additional research would be required to address these questions.

From a methodological standpoint, the findings from the Volpe study suggest that it is indeed possible to reliably measure driver satisfaction with roadway quality. Numerous examples in the data illustrate the ways in which the driver ratings were consistent with observable roadway conditions. A few examples include:

- In both samples drivers registered an increase in satisfaction with Roadside Landscaping, due to the seasonal variation in when the two waves were conducted.
- Off-peak drivers were more satisfied than peak drivers with roadway factors pertaining to traffic flow and traffic signal coordination.
- Drivers who crossed the railroad tracks as part of their trip were less satisfied compared to drivers who did not have to cross the railroad tracks

Based on the evaluation team's assessment of the robustness of the method, a set of "lessons learned," or guidelines, was developed for use by other evaluators. The chapter on lessons learned highlights the issues that evaluators will need to consider in designing and implementing similar driver evaluations. A few key recommendations include:

- Control for externalities in the design of the study
- Develop a sampling strategy tailored to the specific research question
- Employ rigorous data collection procedures

While the methodology developed for the Cobb County study is recommended for use in future, similar evaluations, it may be necessary to modify the methodology, depending on the specific research question being addressed (or the specific characteristics of the test site). Evaluators will need to assess which components of the methodology can be adopted "off the shelf," and which need to be tailored.

Appendix A: The Study Brochure

Q. Why Should I Participate?

During this study, opinions and satisfaction ratings from all drivers are needed, including those who use the roads to get to work as well as those who use them to access nearby stores. Whether you travel during the morning or afternoon peak, mid-day, or on the weekends, your input is needed to ensure that the results are representative of all local roadway users.

Your involvement is important because the US Department of Transportation needs to obtain input from a wide range of drivers on the local roadways. The results will be used to develop satisfaction ratings that can then be used when identifying and prioritizing roadway improvement projects. As a local road user, your input is critical to ensure that these ratings are as accurate as possible.

Q. What If I Want More Information?

Please contact:

Jane Lappin,
US Department of Transportation
Volpe National Transportation Systems Center
617-494-3692
lappin@volpe.dot.gov

c/o **Driver Satisfaction Survey**
3006 Bee Caves Road, Suite A300
Austin, Texas 78746

DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

Help us to measure Driver Satisfaction with Local Roadways!

Read inside about how to participate.

Survey conducted by NuStats
on behalf of:

US Department of Transportation
in cooperation with
Cobb County Department of Transportation

NuStats

Q. What Is The Driver Satisfaction Survey?

This landmark study, led by the US Department of Transportation, in cooperation with the Cobb County Department of Transportation, will measure driver satisfaction with conditions on local roadways. This study is designed to identify the factors or roadway conditions that are most important to driver satisfaction. The results of the study will be used to help transportation planners across the country make the most of limited funds by focusing them on improvements that do not involve new road construction but are directly related to driver satisfaction.

This first phase of the survey will obtain driver satisfaction ratings from 500 local drivers who travel frequently on Paces Ferry Road and/or Spring Road. In the spring, those same drivers will be asked to repeat the survey process, so that any seasonal variations can be identified.

Q. How Was I Selected?

Since it is not cost effective to survey every household in your area, a representative sample is taken that focuses on households surrounding the local roadways being studied. The telephone numbers were randomly selected by a computer.

Contacting your household for this survey is legal – survey organizations are exempt from Do-Not-Call lists.

Q. What Does My Participation Involve?

An Interviewer from NuStats, a nationally recognized survey research firm, will call randomly selected households in your area. During this phone call, questions will be asked to identify those who routinely drive on 1) Paces Ferry Road, between Atlanta Road SE and Paces Mill Road, and 2) Spring Road, between Countryside and Cobb Parkway.

Next, questions will be asked about your typical travel habits and then some background information that will be used for statistical purposes only. These questions will help identify a "typical" trip that you will be making in the following week to use as your "scheduled drive." *This is a trip that you normally make and which represents your typical use of the roadway near to your home.*

Next, you will receive a packet that contains:

1) **Background Information Form**
2) **Driver Survey**

The **Background Information Form** is designed to obtain more details about your "typical" trip as well as your driving habits in general. It contains less than 20 questions and takes about 3 to 5 minutes to complete.

The **Driver Survey** is what you will complete as soon after your scheduled drive as possible. It contains 13 questions designed to help you evaluate road conditions encountered during your "scheduled drive."

Once you've completed the Background Information Form and Driver Survey, you can provide the information to us in one of the following three ways:

Enter your information via the Internet http://surveys.nustats.com:8080/volpe/

Fax your completed forms to 512-306-9077, Attn: Stacey Bricka

Mail the completed Form and Survey to us in the postage-paid envelope that is included in the packet.

The survey data will be used solely to provide information on overall driver satisfaction with conditions on the local roadways. Your information will be grouped with all the other households and will not be analyzed individually. The information you provide as part of the survey will be held in strict confidence. Individual data will not be released to any persons or agencies.

Appendix B: Wave 1 Recruitment Screener

COBB COUNTY DRIVER SATISFACTION STUDY – RECRUITMENT SURVEY QUESTIONNAIRE

Hi, my name is _____ and I'm calling on behalf of the U.S. Department of Transportation and Cobb County. May I speak with [**FNAME** **LNAME**]? [If new person, reintroduce, if same person, continue]. The U.S. DOT and Cobb County are working on a study to measure driver satisfaction on area roadways. We are specifically looking at satisfaction with routine trips along the local roads of Paces Ferry and Spring Road. Your opinions and satisfaction levels will help transportation planners across the country focus their limited dollars on improvements that would make the most difference to you. The study data will be kept confidential and will only be evaluated as part of the data set from 500 other drivers.

To make sure you qualify, can you tell me if you regularly drive on either Paces Ferry Road, between Atlanta Road and Paces Mill Road, or Spring Road, between Countryside and Cobb Parkway?
IF NOT, ASK IF THERE IS ANOTHER HHLD MEMBER THAT DOES QUALIFY, REINTRODUCE AND CONTINUE.

CONFIRM: So do you drive on (check all that apply)

1. the section of Paces Ferry Road from at least Atlanta Road to I-285, if not further towards Paces Mill Road (or vice versa)
2. the section of Paces Ferry Road from at least Paces Mill Road to I-285, if not further towards Atlanta Road (or vice versa)
3. the section of Spring Road from Countryside Lane (which is near the Blockbuster Video) to Cobb Parkway, if not all the way from Atlanta Road to Cobb Parkway (or vice versa)

IF THEY DON'T DRIVE ANY ONE OF THE THREE THEY DO NOT QUALIFY

Are you between the ages of 21 and 75?

1 Yes
2 No - ASK FOR ANOTHER HOUSEHOLD MEMBER AGE 21-75, IF NONE TERMINATE

Do you have a valid driver's license? IF NO, ASK FOR ANOTHER HOUSEHOLD MEMBER AGE 21-75 THAT DOES HAVE A VALID DRIVER'S LICENSE. IF NO ONE ELSE, TERMINATE.

And how many vehicles are available to members of your household? (This number should include all cars, trucks, vans, and motorcycles, whether owned, leased, or provided by an employer and in working condition.)
ENTER NUMBER
00 ZERO – TERMINATE NOT QUALIFIED
98 DON'T KNOW – TERMINATE WITH BELOW TEXT
99 REFUSED – terminate "Thank you but without this information, your household will not be able to participate in this study." PAUSE AND GIVE FINAL OPPORTUNITY FOR RESPONDENT TO ANSWER BEFORE TERMINATING

Do you work for Cobb County, the Georgia Department of Transportation, or the US Department of Transportation? *(If yes, terminate)*
1 Yes - ASK FOR ANOTHER HOUSEHOLD MEMBER, IF NONE TERMINATE
2 No

Paces Ferry Section
In a typical week, how many times do you drive any stretch of Paces Ferry Rd between Atlanta Road on the West Side of 285 and Paces Mill Road on the East of 285? [Note: This number should be one way trips, a round trip from home to work on this road counts as two trips]
ENTER NUMBER
00 ZERO– NOT ELIGIBLE
01 ONE– NOT ELIGIBLE
02 TWO– NOT ELIGIBLE
03 THREE– NOT ELIGIBLE
04 FOUR– NOT ELIGIBLE
05 FIVE– NOT ELIGIBLE
99 DK/RF – NOT ELIGIBLE

If not eligible – is there anyone in your household that typically drives on Paces Ferry Road, at least to the interstate and at least 3 ROUND TRIPS per week?
1 Yes - REINTRODUCE TO THAT PERSON AND RESTART SURVEY
2 No – JUMP TO **SPRING RD / COBB PARKWAY SECTION OR TERMINATE**

And when you travel on Paces Ferry Road, do you usually drive the same route, for example always taking one road that connects to Paces Ferry Road and turning at a specific intersection off of it, or do you drive along different sections of it?
1 Take same route
2 Route varies along paces ferry
IF "Take the same route", What roads are your access and exit roads?
[Enter Access Road 1]
[Enter Access Road 2]

When do you typically drive on that stretch of Paces Ferry Rd? YES/NO Check Box

Day of Week	AM Peak (7-9 am)	PM Peak (4 – 6 pm)	Weekday Off Peak (9 am to 4 pm)	Weekend Off Peak (7 am to 6 pm)
Tuesday				[redacted]
Wednesday				
Thursday				
Saturday	[redacted]			
Sunday				

FOR EACH "YES" ASK "What is the purpose of that trip?

1 Work
2 School
3 Visiting Friends/Family
4 Shopping
5 Personal Business
6 Recreation
7 Pick up/ Drop off person
8 Other (Specify)

SKIP TO SCHEDULING SECTION

Spring Rd / Cobb Parkway Section

In a typical week, how often do you drive any part of Spring Road, particularly from Countryside Place to Cobb Parkway? [Note: This should be one way trips, a round trip from home to work on this road counts as two trips.]

ENTER NUMBER

00 ZERO – NOT ELIGIBLE
01 ONE – NOT ELIGIBLE
02 TWO – NOT ELIGIBLE
03 THREE – NOT ELIGIBLE
04 FOUR – NOT ELIGIBLE
05 FIVE – NOT ELIGIBLE
99 DK/RF – NOT ELIGIBLE

If not eligible – is there anyone in your household that typically drives on Spring Rd to Cobb Parkway at least 3 times per week?

1 Yes - REINTRODUCE TO THAT PERSON AND RESTART SURVEY
2 No – NOT QUALIFIED

And when you travel on Spring Road, do you usually drive the same route, for example always taking one road that connects to Spring Road and turning at a specific intersection off of it, or do you drive along different sections of it?

1 Take same route
2 Route varies along Spring Road

IF "Take the same route", What roads are your access and exit roads?

[Enter Access Road 1]
[Enter Access Road 2]

When do you typically drive on that stretch of Spring Rd/ Cobb Parkway? YES/NO Check Box

Day of Week	AM Peak (7-9 am)	PM Peak (4 – 6 pm)	Weekday Off Peak (9 am to 4 pm)	Weekend Off Peak (7 am to 6 pm)
Tuesday				
Wednesday				
Thursday				
Saturday				
Sunday				

As with Paces Ferry section – need to know purpose for each "yes" in box above. ask "What was the purpose of that trip?

1 Work
2 School
3 Visiting Friends/Family
4 Shopping
5 Personal Business
6 Recreation
7 Pick up/ Drop off person
8 Other (Specify)

Scheduling Section

As I said before, the purpose of this study is to measure driver satisfaction with these specific roadways in the area. In particular, we're interested in how satisfied you are with certain aspects of your drive along **Paces Ferry Road/Spring Rd**. What we'd like you to do is drive **Paces Ferry Road/Spring Rd** on a specific day and time when you'd normally be driving on the road. Then, after you make that drive, you would complete a survey about your driving experience. Your responses can be entered online or mailed back in a postage paid envelope.

Is this something that you think you could help us with?

1 Yes
2 No – TERMINATE

If Yes: We'd like to have you drive on **Paces Ferry Road/Spring Rd** at a time when you would normally be driving, so when you make this particular drive you'd be following your normal routine. How does [_____] work for you?
[Pull a random choice from the yes/no section]
If this is not a good day/time manually select a day/time that works for the respondent.

Background Questions

Now I just need to ask a few more questions, to make sure that we're including all types of households from your area.

Gender (code by observation)
1 Male
2 Female

Including yourself, how many people live in your household?
[Enter Number]

Of those, how many are under the age of 18.
[Enter Number]

Including yourself, how many members are 18 or older?
[Enter Number]
(cati check that under 18 and 18+ sum to total # in hh)

What is your age? (Must be between 21 and 75)
[Enter Number]

What is the highest degree or level of school you have completed?
1 Not a high school graduate, 12 grade or less
2 High school graduate (high school diploma or GED)
3 Some college credit but no degree
4 Associate or technical school degree
5 Bachelors or undergraduate degree
6 Graduate degree (includes professional degree like MD, DDs, JD)
7 OTHER, SPECIFY
8 DK/RF

Are you employed, either full-time or part-time?
1 Yes – Full Time (30+ hrs per week)
2 Yes – Part-time (< 30 hrs per week)
3 No

IF NOT EMPLOYED: Which of the following best describes your current situation?
1 Retired,
2 Disabled / On Disability Status,
3 Homemaker,
4 Unemployed but looking for work,
5 Unemployed and not looking for work, or
6 a Student?
7 Other (specify)
9 DK/RF

To ensure your household properly represents others in the region, please stop me when I read the range that best describes your household income for 2003?
$0 - $14,999
$15,000 - $24,999
$25,000 - $34,999
$35,000 - $49,999
$50,000 to $74,999
$75,000 to $99,999
$100,000 or more
REFUSED

IF REFUSED: I appreciate your concerns about providing this information, but I only need to properly identify your household as belonging to one of the following categories: READ INCOME LIST AGAIN

I'd like to confirm your full name and mailing address so I can send the survey to you. (since listed sample, can't we pre-load and confirm here?
Name _____
Address _____
City, State, Zip _____

Do you have an email address we can send an e-reminder to. [Note: must check email account on a daily basis]
[Enter Address]

Is your home address the same as your mailing address?
1 Yes
2 No
If no, what is your home address?
Name _____
Address _____
City, State, Zip _____

We will be emailing and making reminder calls the day before your scheduled drive.
Is [number] the best phone number to reach you at?
1 Yes
2 No
If no, what is a better number to contact you at?
[Enter Number ###-###-####]

Thank you for your help with this important study! Please keep an eye out for the survey packet. After you receive it, you'll find it useful to review the driver survey before you make this particular trip, and you should plan to complete the driver survey as soon after you make that trip as possible.

Appendix C: Wave 1 Survey Packet

Appendix C includes the following wave 1 materials mailed to all recruited participants:

- Letter
- Background survey
- Driver survey.

Please note that for the study, the Background and Driver surveys were formatted to fit on one page (legal size).

<FNAME> <LNAME>
<ADDRESS>
<CITY>, < ST> <ZIP>

Dear <FNAME>:

Thank you for agreeing to participate in the **Driver Satisfaction Study**. As we explained to you on the telephone, the purpose of this study is to measure levels of driver satisfaction with specific roadway segments in the Atlanta region – in your case, <roadname>. This study is the first of its kind to be conducted in the United States and, if successful, will lead the way in developing more accurate measurements of driver satisfaction.

The study process involves three steps.

1. First, please review the two enclosed forms:
   - **Background Information**: This helps us to understand your regular travel on <roadname> and provides us some information about your vehicle.
     Please complete this sheet prior to your scheduled drive.
   - **Driver Survey**: The survey contains questions about your driving experience on <roadname> on the date and time of your drive.
     The survey needs to be completed as soon after your scheduled drive as possible.

   Both forms are equally important for our study. If you have any questions or would like assistance in completing these forms, please call Stacey Bricka at 1-800-447-8287, ext. 2240 or email her at sbricka@nustats.com. Stacey is managing the survey on behalf of the US Department of Transportation.
2. Second, drive <roadname> on <time>, following your normal routine for making that particular trip. Before you start your drive that day, please review the questions we ask as part of the Driver Survey. We also ask that you not use your cellular phone during that portion of your drive if at all possible.
3. Finally, report the information from the Background Information Sheet and Driver Survey. You can do this in one of three ways:

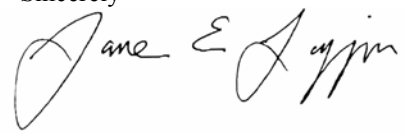
    by logging on to http://surveys.nustats.com:8080/volpe/

    faxing your completed forms to Stacey Bricka at 512-306-9077,

    or simply mailing the forms to us in the enclosed postage-paid envelope.

Again, we appreciate your assistance in this important study and have enclosed a small token of appreciation. If you would like to verify the information you've been told, please feel free to contact Joe Fletcher, Operations Division Manager at the Cobb County Department of Transportation (770-528-1684). You can also call me at 617-494-3692 to verify the study information or if you have more general questions about the process.

Sincerely



Jane Lappin, Program Manager

BACKGROUND INFORMATION

The following questions will help us understand your usual driving experience when you are on <roadname> <day> between the hours of <time>. Please complete this form prior to your scheduled drive.

Driver ID: < #### > Driver: <name>
Drive Date: <day>, <date> Drive Time: <time> Route: <roadname>

ABOUT YOUR TRIP

1. When you usually drive on <roadname> <during the week> between the hours of <7am and 9am>, where do you start this trip?

- ◯ **Home → Continue with Question 2**
- ◯ **Other ↴ What is that address?**

Street: _____

City/State/Zip: _____

2. What is your main activity at that place?

- ◯ **1.** Home
- ◯ **2.** Visiting Friends/Family
- ◯ **3.** Personal Business
- ◯ **4.** Work
- ◯ **5.** Other: *(specify)* _____
- ◯ **6.** Shopping
- ◯ **7.** School
- ◯ **8.** Recreation

3. What road(s) do you usually take to get to <roadname> when you make this trip?

_____

_____

4. When you turn off of <roadname>, what road(s) do you usually take to get to your final destination?

_____

_____

5. And where are you going?

- ◯ **Home → Continue with Question 6**
- ◯ **Other ↴ What is that address?**

Street: _____

City/State/Zip: _____

6. What is your main activity there? *(enter code from Question 2)* ☐

7. Approximately, how many miles is that trip?

☐ *Number of miles*

8. And how long does it typically take you to make that trip?

☐ *Number of minutes*

9. And when you usually make this trip do you typically make any stops along the way (i.e. at shops, businesses, etc.)?

- ◯ **No → Continue with Question 10**
- ◯ **Yes → How many stops do you usually make?** ☐

9b. For each stop, please indicate where and why you make that stop. *(For Activity, use code from Question 2)*

Stop:	Place Name:	Was stop before, on, or after <roadname>?	Activity
1	_____	◯ Before ◯ On ◯ After	☐
2	_____	◯ Before ◯ On ◯ After	☐
3	_____	◯ Before ◯ On ◯ After	☐
4	_____	◯ Before ◯ On ◯ After	☐

10. When you usually make this trip, how concerned are you about arriving at your destination on time?

◯ Not at all concerned ◯ Somewhat concerned ◯ Very concerned

11. In general, how much flexibility in your schedule do you have regarding when you make this particular trip?

◯ No flexibility ◯ Some flexibility ◯ A lot of flexibility

12. Not including yourself, how many others are usually in the vehicle with you when making this trip?

- ◯ No one else
- ◯ Household Members: *(specify number)* _____
- ◯ Non-Household Members: *(specify number)* _____

13. When you usually make this trip, do you perform any of the following activities while driving on <roadname>? *(mark all that apply)*

- ◯ Use a cellular phone
- ◯ Listen to music on the radio, CDs or tapes
- ◯ Listen to talk shows on the radio
- ◯ Eat or drink
- ◯ Other: *(specify)* _____

14. How important are the following road conditions to you when you normally make this trip?

Road Condition	Extremely Unimportant						Extremely Important
a. Lane width	1	2	3	4	5	6	7
b. Quality of road pavement	1	2	3	4	5	6	7
c. Quality of pavement markings	1	2	3	4	5	6	7
d. Roadside landscaping	1	2	3	4	5	6	7
e. Driving behavior of other road users	1	2	3	4	5	6	7
f. Overall level of traffic congestion	1	2	3	4	5	6	7
g. Number of times stopped by a red light	1	2	3	4	5	6	7
h. Amount of time spent at red lights	1	2	3	4	5	6	7
i. Amount of green light time for side streets	1	2	3	4	5	6	7
j. Traffic signal coordination along route	1	2	3	4	5	6	7
k. Your overall travel speed	1	2	3	4	5	6	7
l. Availability of turn lanes	1	2	3	4	5	6	7

About Your Vehicle

V1. What is the year, make, and model of the vehicle you typically use to make this trip?

Year _____ *Make:* _____ *Model:* _____

V2. Is this a . . .

- ◯ Car
- ◯ Minivan
- ◯ Sport Utility Vehicle
- ◯ Pick-up Truck
- ◯ Motorcycle
- ◯ Other: *(specify)* _____

General Driving Habits

G1. On average, how many miles a year do you personally drive? *Please consider all vehicles you drive, whether you own those vehicles or not, and all reasons you drive (including travel for business or while on vacation).*

- ◯ Less than 5,000 miles
- ◯ 5,000 – 9,999 miles
- ◯ 10,000 – 14,999 miles
- ◯ 15,000 – 19,999 miles
- ◯ 20,000 miles or more

G2. If you consider all the driving you do in a given year, what percent of your time do you spend driving on local roadways as compared to major thoroughfares or highways? *Record the percent of time spent on each roadway type below (the three numbers should add to 100%).*

- ☐ Local Neighborhood Streets *(examples: Skyline Trail, Lakeview Lane, etc.)*
- ☐ Main Roads or Thoroughfares *(examples: Paces Ferry Road, Cumberland Parkway, etc.)*
- ☐ Highways *(examples: I-285, I-75, I-20, I-85, etc.)*

THANK YOU!

To Report your Information:

(1) log onto *http://surveys.nustats.com:8080/volpe/*,
(2) fax to 512-306-9077, or (3) return with your completed driver survey in the postage-paid envelope.

DRIVER SURVEY

Please review this form prior to the scheduled drive date and time, then answer the questions as soon after you finish the drive as possible. **Please answer these questions only for the section of your trip that was along <roadname>?**

Driver ID: < #### > Driver: <name>
Drive Date: <day>, <date> Drive Time: <time> Route: <roadname>

ABOUT YOUR TRIP

1. Please record the date and time you made this drive.

Date: _____ *Time:* _____

2. What road(s) did you take to get on to <roadname>?

_____

_____

3. Where did you get off <roadname>? *(specify road name)*

_____

_____

4. Was this drive typical compared to conditions when you usually make this drive:

4a. On <roadname>?

◯ **Yes → Continue with Question 4b**

◯ **No ↴ Describe what made this drive different from most.**

_____

_____

4b. On the other roads you used to make this trip?

◯ **Yes → Continue with Question 5**

◯ **No ↴ Describe what made this drive different from most.**

_____

_____

5. In thinking about the level of traffic congestion you experienced today on <roadname>, how normal was that compared to what you typically experience when driving at this time of day? *(mark all that apply)*

◯ Much lighter traffic congestion today than normal
◯ Somewhat lighter traffic congestion today than normal
◯ About the same level of traffic congestion today as normal
◯ Somewhat heavier traffic congestion today than normal
◯ Much heavier traffic congestion today than normal

6. While making your scheduled drive today, how concerned were you about arriving at your destination on time?

◯ Not at all concerned ◯ Somewhat concerned ◯ Very concerned

7. How much flexibility in your schedule did you have today regarding <u>when</u> you made this particular trip?

◯ No flexibility ◯ Some flexibility ◯ A lot of flexibility

8. Not including yourself, how many others were in the vehicle with you when making this trip?

◯ No one else
◯ Household Members: *(specify number)* _____
◯ Non-Household Members: *(specify number)* _____

9. Did you perform any of the following activities while driving on <roadname> today? *(mark all that apply)*

◯ Used a cellular phone
◯ Listened to music on the radio, CDs or tapes
◯ Listened to talk shows on the radio
◯ Ate or drank
◯ Other: *(specify)* _____

Continue with Question 10 →

10. How satisfied were you with the following road conditions today on <roadname>?

Road Condition	Extremely Dissatisfied						Extremely Satisfied
a. Lane width	1	2	3	4	5	6	7
b. Quality of road pavement	1	2	3	4	5	6	7
c. Quality of pavement markings	1	2	3	4	5	6	7
d. Roadside landscaping	1	2	3	4	5	6	7
e. Driving behavior of other road users	1	2	3	4	5	6	7
f. Overall level of traffic congestion	1	2	3	4	5	6	7
g. Number of times stopped by a red light	1	2	3	4	5	6	7
h. Amount of time spent at red lights	1	2	3	4	5	6	7
i. Amount of green light time for side streets	1	2	3	4	5	6	7
j. Traffic signal coordination along route	1	2	3	4	5	6	7
k. Your overall travel speed	1	2	3	4	5	6	7
l. Availability of turn lanes	1	2	3	4	5	6	7

11. Overall, how satisfied were you with your driving experience today on <roadname>?

	Extremely Dissatisfied						Extremely Satisfied
a. Overall satisfaction	1	2	3	4	5	6	7

12. Of the road conditions listed in Question 10, please indicate which three were the MOST important to you while making this drive today? *(write in letter of road condition from Question 10)*

☐ MOST important ☐ 2nd most important ☐ 3rd most important

13. Of the road conditions listed in Question 10, please indicate which three were the LEAST important to you while making this drive today? *(write in letter of road condition from Question 10)*

☐ LEAST important ☐ 2nd least important ☐ 3rd least important

COMMENTS

Please use the space below (or the back of this sheet) to record additional comments or feedback regarding your driving experience on <roadname> today.

THANK YOU!

TO REPORT YOUR INFORMATION:

(1) log onto *http://surveys.nustats.com:8080/volpe/*,
(2) fax to 512-306-9077, or (3) return with your completed driver survey in the postage-paid envelope.

Appendix D: Panel Maintenance Letter

U.S. Department
of Transportation
**Research and
Special Programs
Administration**

John A. Volpe
National Transportation
Systems Center

Kendall Square
Cambridge, Massachusetts 02142

February 24, 2005

«FIRSTNAME» «LASTNAME» «PHONE» «SAMPN»
«ADDRESS» «EMAIL»
«CITY», «STATE» «ZIP»

Dear «FIRSTNAME»:

Thank you for your help in the first phase of the Cobb County Driver Satisfaction Study!

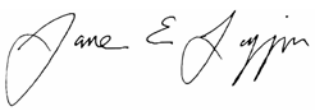
This study is the first of its kind to be conducted in the United States. The information you have provided will play an essential role in our understanding of which roadway attributes of «ROAD» are most important to you. Our ultimate goal is to work with transportation planners to incorporate driver satisfaction into the road design of the future.

We will be contacting you shortly for the final phase of the study and asking you to repeat the drive. This phase, which is scheduled for late-March through mid-May, will give us a second set of measures for a different season and will improve the overall quality of the study. As in the first part of the study, we will call you to schedule your drive and send you survey forms that you will complete and return immediately following your drive. In the meantime, we ask your help with the following:

1. Confirm your contact information: We have listed your contact information (including phone and email) at the top of this letter. If your information has changed or you anticipate it changing before April, please correct the information listed and either fax the updates to Stacey at 1-800-626-9294 (toll-free fax line) or go to the project website and update your information directly using your driver id «DRIVERID» **http://surveys.nustats.com:8080/volpe/**
2. Let us know if you have questions or feedback: Because we cannot conduct this study without your help, we have also opened a comment form on the project website if you would like to give us feedback on the survey process or have questions about the spring survey effort. If you do not have internet access, you can also call Stacey Bricka at 1-800-447-8287, ext 2240 or fax her your comments at 1-800-626-9294.

Your continued participation is vital to the success of the study. We appreciate the time and effort that you have put into the survey, and are including a small token of appreciation for your time. We look forward to talking with you in a few months, but if you have questions or comments in the meantime, please feel free to contact me at 617-494-3692 or **jane.lappin@volpe.dot.gov**.

Sincerely,



Jane Lappin
Program Manager

Appendix E: Wave 2 Recruitment Screener

Hi, my name is _____ and I'm calling on behalf of the U.S. Department of Transportation and Cobb County. May I speak with [**FNAME** **LNAME**]? [If new person, reintroduce, if same person, continue]. The U.S. DOT and Cobb County are working on a study to measure driver satisfaction on area roadways and you helped us with the first phase by driving on [ROAD] back in [MONTH]. We definitely appreciate your help with that effort!

We are now beginning the second and final phase of the study so we can obtain a second set of opinions and satisfaction levels for a different season, which will improve the quality of the overall study. We'd like to ask your help by making the same drive one more time and completing a second driver's survey, which will look a lot like the first driver's survey you completed.

To confirm that you are eligible for this second phase, I'd like to make sure that you are still driving on [ROAD], on [DAY OF WEEK]s between the hours of [HOURS] for [PURPOSE]. Is this correct?
Yes – SCHEDULE FOR TRAVEL
No – if not, how has it changed? (documentation and flag – daily checks by project manager)

To be eligible, the respondent needs to use the roadway during the same time period and on the same day of week (weekday if original drive was Tues-Thurs, Saturday if original drive was Saturday, and Sunday if original drive was Sunday). For trip purpose, the priority is to match the wave 2 trip purpose exactly. However, should that not be possible, interviewers are allowed to match within groups. Should a respondent report a change that is outside the original grouping (from subsistence to maintenance, for example) the interviewer pends that case and not schedule the respondent for travel. The trip purpose groups are:

- Subsistence (Work, School)
- Maintenance (Personal Business)
- Discretionary (Home, Shopping, Visiting Friends/Family, Recreation)

Great. What we'd like to do is ask you to complete the new driver's survey after traveling on [ROAD] on [DAY, DATE] between the hours of [TIME], when you're making a typical [PURPOSE] trip. Will this be a typical travel day for you?
Yes – schedule
No – what about …

As with the first survey, I'll mail you a packet that contains the driver survey and a small token of our appreciation for your help with this survey. As with the first survey, you'll be able to return the completed survey by using a postage paid envelope, entering your information on our website, or faxing it to a toll-free fax number. To mail the new driver survey to you, I'd like to confirm that your address is still … ?
CONFIRM ADDRESS

[IF EMAIL] And can I still email a reminder to you at [EMAIL]? (yes/no, if no- get new email account)
[IF NO EMAIL] Do you have an email account where I can send a reminder to you? (yes/no, if yes- get new email account)

We will be emailing and making reminder calls the day before your scheduled drive. Is [number] the best phone number to reach you at?
1 Yes
2 No
If no, what is a better number to contact you at? [Enter Number ###-###-####]

Thank you for your help with this important study! Please keep an eye out for the survey packet. After you receive it, you'll find it useful to review the driver survey before you make this particular trip, and you should plan to complete the driver survey as soon after you make that trip as possible. Do you have any questions that I can answer for you at this time?

Appendix F: Wave 2 Survey Packet

<FNAME> <LNAME> <<DATE>>
<ADDRESS>
<CITY>, < ST> <ZIP>

Dear <FNAME>:

Thank you for agreeing to participate in the final phase of the **Cobb County Driver Satisfaction Study**. As we explained to you on the telephone, the purpose of this last survey is to document levels of driver satisfaction with specific roadway segments in the Atlanta region – in your case, <roadname> -- for a different season and to increase the statistical reliability of our results.

As with the first time you completed the survey for us, the study process involves three steps.

4. First, please review the enclosed **Driver Survey**: The survey contains questions about your driving experience on <roadname> on the date and time of your drive.
5. Second, drive <roadname> on <time>, following your normal routine for making that particular trip. Before you start your drive that day, please review the questions we ask as part of the Driver Survey. We also ask that you not use your cellular phone during that portion of your drive if at all possible.
   The survey needs to be completed as soon after your scheduled drive as possible.
6. Finally, report the information from the Driver Survey. You can do this in one of three ways:

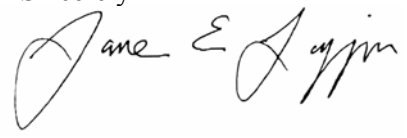
 by logging on to http://surveys.nustats.com:8080/volpe/

 faxing your completed forms to Stacey Bricka at 800-626-9294,

 or simply mailing the forms to us in the enclosed postage-paid envelope.

This study is the first of its kind to be conducted in the United States and thanks to your help, has been successful in helping to identify more accurate measurements of driver satisfaction. Again, we appreciate your assistance in helping us to complete this important study and have enclosed a small token of appreciation. If you would like to verify the information you've been told, please feel free to contact Joe Fletcher, Operations Division Manager at the Cobb County Department of Transportation (770-528-1684). You can also call me at 617-494-3692 to verify the study information or if you have more general questions about the process.

Sincerely



Jane Lappin, Program Manager

P.S. If you have any questions about the driver survey or would like assistance in completing these forms, please call Stacey Bricka at 1-800-447-8287, ext. 2240 or email her at sbricka@nustats.com. Stacey is managing the survey on behalf of the US Department of Transportation.

DRIVER SURVEY

Please review this form prior to the scheduled drive date and time, then answer the questions as soon after you finish the drive as possible. **Please answer these questions only for the section of your trip that was along <roadname>?**

Driver ID: < #### > Driver: <name>
Drive Date: <day>, <date> Drive Time: <time> Route: <roadname>

ABOUT YOUR TRIP

1. Please record the date and time you made this drive.

Date: _____ *Time:* _____

2. What road(s) did you take to get on to <roadname>?

_____

_____

3. Where did you get off <roadname>? *(specify road name)*

_____

_____

4. Was this drive typical compared to conditions when you usually make this drive:

4a. On <roadname>?

◯ **Yes → Continue with Question 4b**

◯ **No ↴ Describe what made this drive different from most.**

_____

_____

4b. On the other roads you used to make this trip?

◯ **Yes → Continue with Question 5**

◯ **No ↴ Describe what made this drive different from most.**

_____

_____

5. In thinking about the level of traffic congestion you experienced today on <roadname>, how normal was that compared to what you typically experience when driving at this time of day? *(mark all that apply)*

◯ Much lighter traffic congestion today than normal
◯ Somewhat lighter traffic congestion today than normal
◯ About the same level of traffic congestion today as normal
◯ Somewhat heavier traffic congestion today than normal
◯ Much heavier traffic congestion today than normal

6. While making your scheduled drive today, how concerned were you about arriving at your destination on time?

◯ Not at all concerned ◯ Somewhat concerned ◯ Very concerned

7. How much flexibility in your schedule did you have today regarding <u>when</u> you made this particular trip?

◯ No flexibility ◯ Some flexibility ◯ A lot of flexibility

8. Not including yourself, how many others were in the vehicle with you when making this trip?

◯ No one else
◯ Household Members: *(specify number)* _____
◯ Non-Household Members: *(specify number)* _____

9. Did you perform any of the following activities while driving on <roadname> today? *(mark all that apply)*

◯ Used a cellular phone
◯ Listened to music on the radio, CDs or tapes
◯ Listened to talk shows on the radio
◯ Ate or drank
◯ Other: *(specify)* _____

Continue with Question 10 →

10. How satisfied were you with the following road conditions today on <roadname>?

Road Condition	Extremely Dissatisfied						Extremely Satisfied
a. Lane width	1	2	3	4	5	6	7
b. Quality of road pavement	1	2	3	4	5	6	7
c. Quality of pavement markings	1	2	3	4	5	6	7
d. Roadside landscaping	1	2	3	4	5	6	7
e. Driving behavior of other road users	1	2	3	4	5	6	7
f. Overall level of traffic congestion	1	2	3	4	5	6	7
g. Number of times stopped by a red light	1	2	3	4	5	6	7
h. Amount of time spent at red lights	1	2	3	4	5	6	7
i. Amount of green light time for side streets	1	2	3	4	5	6	7
j. Traffic signal coordination along route	1	2	3	4	5	6	7
k. Your overall travel speed	1	2	3	4	5	6	7
l. Availability of turn lanes	1	2	3	4	5	6	7

11. Overall, how satisfied were you with your driving experience today on <roadname>?

	Extremely Dissatisfied						Extremely Satisfied
a. Overall satisfaction	1	2	3	4	5	6	7

12. Of the road conditions listed in Question 10, please indicate which three were the MOST important to you while making this drive today? *(write in letter of road condition from Question 10)*

☐ MOST important ☐ 2nd most important ☐ 3rd most important

13. Of the road conditions listed in Question 10, please indicate which three were the LEAST important to you while making this drive today? *(write in letter of road condition from Question 10)*

☐ LEAST important ☐ 2nd least important ☐ 3rd least important

COMMENTS

Please use the space below to record how your driving experience on <roadname> may have changed in the last few weeks. If there have been no changes, just note "NONE."

Please use the space on the back of this sheet to record additional comments or feedback regarding your driving experience on <roadname> today.

THANK YOU!

TO REPORT YOUR INFORMATION:

(1) log onto *http://surveys.nustats.com:8080/volpe/*,
(2) fax to 800-626-9294, or
(3) mail back to us - just fold (with the Business Reply Mail showing) and close with tap