FINAL REPORT

ON-BOARD BUS AND RAIL SURVEY
RFP# 135
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Prepared for:
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Policy and Planning Development
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October 1990
EXECUTIVE SUMMARY

This final report describes the methods and procedures used by George Hoyt & Associates, Inc. (GH&A), to conduct and analyze ridership survey data for the Metropolitan Atlanta Rapid Transit Authority (MARTA). In all, four surveys were conducted. These included two on-board surveys, for both rail and bus; and two station surveys, one to determine station mode of arrival and one to determine attitudes regarding service quality and cost.

The on-board surveys were conducted in the fall of 1989 (October 16th-December 16th). They included surveying both weekday and weekend trips on a representative sample of trains and buses in operation during the survey period. The station mode of arrival survey was conducted in parallel with the on-board surveys. The service quality/cost survey was conducted in February, 1990.

BACKGROUND & OBJECTIVES OF THE SURVEYS

The research goal and objectives of the On-board Bus and Rail Survey are presented in Exhibit 1. The data collected on the bus and rail ridership will be used to refine and calibrate the various passenger demand models used by MARTA staff.

The major focus of the on-board surveys was to determine the characteristics of MARTA's passengers and their usage of the system. Since a large proportion of MARTA's bus riders also use the rail system for some portion of their trips, the major emphasis of the study was the rail system. The objective of the bus survey was to capture data on bus-only patrons and movements (e.g., bus-only trips, bus-to-bus transfers, bus ride-thrus).

In addition to the on-board components of the study, GH&A conducted a special enumeration of passengers entering rail stations, to provide a basis for estimating mode of arrival by time of day. The objective of this survey was to provide a reliable estimate of the proportion of patrons arriving by all available modes by time period.
EXHIBIT 1
STATEMENT OF RESEARCH GOAL AND OBJECTIVES

Goal: To learn travel characteristics, patterns, needs, and prevailing attitudes as they relate to MARTA's current level of service.

Objectives:

1. Identify General Ridership Characteristics (from On-board Survey data):
   A. Fare Payment Method
   B. Trip Purpose
   C. Trip Frequency
   D. Demographics
   E. Attitudinal and Psychographic Data
   F. Mode of Access
   G. Mode of Egress

2. Rail Entry Analysis (from On-board Survey data):
   A. Average Rail Trip Length
   B. % Rail-to-Rail Transferring
   C. % Rail-to-Bus Transferring

3. Determine Total TransCard Bus Boardings (from On-board Survey data):
   A. % TransCard Rail-Bus Transfers Outside Stations
   B. % Transcard Bus-Bus Transfers Outside Stations

4. Determine TransCard Bus-Rail Transfers Outside Stations as a Proportion of TransCard Faregate Entries (from On-board Survey data)

5. Determine Percent Bus-Bus Transfers to Total Bus Linked Trips (from On-board Survey data)


7. Stratify Rail Trips By (from On-board Survey data):
   A. Trip Purpose
   B. Income
   C. Mode of Access to Rail Station
   D. Station of Entry
   E. Station of Egress
   F. Mode of Egress from Rail Station
EXHIBIT 1 (cont)
STATEMENT OF RESEARCH GOAL AND OBJECTIVES

8. Origin and Destination Analysis (from On-board Survey data):
   A. Trip Length Frequency by Income
   B. Sub-Corridor Trip Movements by Income

9. Elderly and Handicapped Analysis (from On-board Survey data):
   A. Proportion of Total System Patronage
   B. Percent of Cash Fares

10. TransCard Analysis (from On-board Survey data):
    A. Ratio of TransCard Initial Bus Boardings to Cash-fare Initial Bus Boardings
    B. Ratio of Cash-fare Bus-to-Bus Transfers to Cash-fare Bus Initial Boardings
    C. Ratio of TransCard Bus-to-Bus Transfers to TransCard Initial Bus Boardings
    D. Ratio of TransCard Initial Rail Boardings to Total Rail Transcard Entries

11. Free Intermodal Pass-Thru Analysis (from On-board Survey data):
    A. % Inbound and Outbound Pass-Thrus from Area
    B. % Inbound and Outbound Bus-to-Bus Pass-Thrus
    C. % Ride-Thrus
Finally, a special attitudinal survey was conducted over a one week time frame to gather data on the riderships' attitudes regarding service quality and cost. The objective of this survey was to provide data to MARTA policy makers as they deliberated tariff and schedule changes.

GENERAL APPROACH

The primary form of data collection for the on-board surveys was the dissemination of questionnaires by surveyors aboard sample bus and train-car trips. The mode of arrival and service quality/cost attitude data were gathered through a combination of direct observation, for enumeration of demographic data, and personal interviews.

Sampling plans were developed for each survey component. For the on-board surveys, these plans were developed to ensure system-wide reliability of ±10% at the 95% confidence interval or better. The mode of arrival survey was designed to produce reliability of ±10% at the 90% confidence interval or better by station/time period. The accuracy requirement for the special attitudinal survey was ±3% at the 95% confidence interval system-wide. Once the sampling plans were approved, several critical procedures were developed and implemented. These included the development of the surveyor's on-board procedures manual, sample selection procedures, and the survey instrument and control logs. After these elements were in place, the necessary survey materials were ordered and temporary personnel (surveyors, editors, coders) were hired and trained. Surveyors attended a classroom training session to become familiarized with procedures, and were then trained under live conditions.

The data editing phase of the survey occurred simultaneously with the conduct of the surveys. As assignments were completed, they were inspected to ensure that the work was successfully performed. The control logs were entered into databases specifically designed for the project, and machine edited. Once the control logs were corrected and rejected work removed, the response data entry phase commenced. Following data entry, all information from the control logs and the responses were
merged and processed through an intense response edit program. This program was
designed to detect many kinds of respondent and coder errors. Errors detected by this
program, including improperly reported trip patterns, were resolved by survey staff to
ensure the cleanest possible data in the final file.

The study design for each survey was based on stratified random sampling
techniques. This approach seeks to minimize variance, and thereby improve the precision
of the resulting estimates by grouping sampling units into reasonably homogeneous groups
(strata). Characteristics used to stratify the target population were based on the research
objectives of each survey. Using this approach, survey results were easily weighted by
stratum to reflect the entire target population.

Another feature of the study designs was the incorporation of explicit methods of
detecting and adjusting for response bias. Response bias occurs when attribute groups
within sampling strata respond to the survey at consistently high or low rates. Unless
specific methods are designed to detect and adjust for response bias, attribute groups may
be misrepresented in the final estimates. Gender and race were selected as relevant
attributes for response bias analysis.

Following the data collection and editing activities, the results of each survey were
weighted to represent the target population and adjusted for response bias. These
weights were computed at the stratum level and then compounded to achieve the final
weight for each response. Where possible, survey data were used to generate estimates
for comparison to "known" control totals. These comparisons provided a basis for
validating the survey techniques and results.

SUMMARY OF SURVEY RESULTS

The general profile of the MARTA® transit rider is black male, between the ages
of 25 and 39. Survey respondents were asked to report their annual household income.
More than one-fourth of the weekday and Saturday respondents indicated they made
$35,000 or more per year. However, most of the survey respondents from Sunday
reported their annual income to be between $15,000 to $24,999. Patrons having less than $15,000 in household income comprise over 30% of the ridership. The average household size of MARTA patrons, based on the results of the survey is one to three members.

The results of the on-board bus and rail survey indicate that the primary "home based" trip making purpose for weekday riders is work (63.7%). The same observation is true for Saturday riders (46.9%). However, as might be expected, the primary trip making purpose on Sunday is personal business (42.0%), followed by work trips (38.6%).

Passengers were asked could they have made the trip another way - without using MARTA. The results showed that most of the weekday (43.4%) and weekend (40.5% - Saturday; 47.5% - Sunday) riders are transit dependent.

Data from the mode of arrival survey show that patterns follow traditional observations. Auto and bus are the primary modes of arrival at suburban rail stations, and walking is the primary mode of arrival at downtown rail stations.

The results of the service quality/attitudinal survey indicated that MARTA passengers would be willing to pay for a fare increase to maintain the level of service they have presently. The dollar amount of increase they would be willing to pay differed based on the mode(s) they used and what type of fare payment they used. Regardless of mode used - rail only, bus only, or both bus and rail - patrons using a senior/handicapped pass would, on the average, pay a higher percent increase than other fare group types.

ACCURACY OF RESULTS

An accuracy analysis was performed to ensure compliance with the research objectives. Better than expected accuracy was produced. The results of this analysis is described below. In each case, the stated accuracy level applies to the statistically worst
case proportion (.5). Appendix A provides a detailed discussion regarding the accuracy of the survey proportions.

The sampling plans for the on-board surveys projected substantially better accuracy than was required by the research objectives. While the actual level of response to these surveys was somewhat lower than planned (8,806 actual versus 10,000 planned), better than expected accuracy resulted. This was due to the nature of the questionnaire. Because a complete travel pattern was determined for each respondent, a single response using both rail and bus contributed to the accuracy of both modes. Final response and accuracy at the 95% confidence interval are presented below.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Day Type</th>
<th>Response</th>
<th>95% C.I. Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail</td>
<td>Weekday</td>
<td>6,183</td>
<td>±1.25%</td>
</tr>
<tr>
<td></td>
<td>Saturday</td>
<td>1,296</td>
<td>±2.72%</td>
</tr>
<tr>
<td></td>
<td>Sunday</td>
<td>1,014</td>
<td>±3.08%</td>
</tr>
<tr>
<td>Bus</td>
<td>Weekday</td>
<td>4,001</td>
<td>±1.55%</td>
</tr>
<tr>
<td></td>
<td>Saturday</td>
<td>769</td>
<td>±3.53%</td>
</tr>
<tr>
<td></td>
<td>Sunday</td>
<td>557</td>
<td>±4.15%</td>
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</tbody>
</table>

The accuracy objective for the mode of arrival survey was ±10% at the 90% confidence interval by station/time period. This level of accuracy could be achieved by collecting 68 representative responses. Generally, the expected minimum number of responses was produced, except during low volume survey hours. Overall, 16,747 responses were gathered during this survey. On the average, accuracy of ±7.44% was achieved for weekday station/time periods, and ±8.36% for weekend station/time periods. Both of these accuracy results are at the 90% confidence interval.

The expected level of accuracy for the service quality/cost attitude survey was ±3% at the 95% confidence level, system-wide. Overall, 1,496 responses were collected during this survey. This resulted in accuracy of ±2.53% at the 95% confidence interval.
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SECTION 1
ON-BOARD BUS AND RAIL SURVEY

This section of the report contains information on the sample design and survey procedures used, as well as procedures for data management and analysis for the on-board bus and rail survey. Analysis of the survey results is also presented. Where appropriate, accuracy of the results is shown. These analyses are presented for the worst case proportion (.5) at the 95% confidence interval. The Research Objectives indicated that accuracy of ±10 at the 95% confidence interval was desired. In each case, the accuracy achieved was better than required by the Research Objectives.

Section 1.1 provides an overview of the procedures employed in conducting the surveys. This includes the sampling plans. Section 1.2 details the data collection procedures, data analysis, weighting and validation of survey results. Section 1.3 presents a summary of the results and their reliability. Appendix A presents a more detailed discussion of the accuracy of the survey proportions. Appendix B contains the record layout for the final factored file and geocoded addresses from the on-board survey.

1.1 SURVEY DESIGN AND PREPARATION

The survey design phase of the project established the basic framework and parameters for conducting the other, subsequent survey-specific tasks. A technical memorandum describing refinements to the original study design contained in GH&A's technical proposal was submitted to MARTA in early October 1989.

The data collected from the on-board surveys were designed to provide estimates for the bus and rail components of the system. These included general ridership characteristics; passenger movement patterns, with special emphasis on within and between mode transfers and origin/destination data; and, fare payment method, particularly Transcard utilization and elderly and handicapped fares.
1.1.1 Sampling Plan

GH&A's sampling plan for the on-board surveys was patterned after UMTA's guidance contained in the "Bus Transit Monitoring Manual." Basically, this involved sampling at the route level, using a sampling rate sufficient to achieve a ±10% reliability at the 90% confidence interval. Route data of this accuracy should produce estimates with ±10% reliability at the 95% confidence interval, system-wide. Finally, more sampling should occur during the peak hours than during other times since a larger proportion of a systems' resources are allocated to providing peak period service.

However, given that the stated objectives of the survey were rail oriented, the sampling plan was modified to be responsive in this manner. The sampling plan was developed to produce a total of 10,000 passenger responses, 8,000 from the rail system and 2,000 from the bus system. It was projected that this level of response would require sampling 1320 train-car trips and 267 bus trips. Since the research objectives for the project required results by day type, the sample plan allocated these samples as follows:

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Train-car Trips</th>
<th>Bus Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>776</td>
<td>157</td>
</tr>
<tr>
<td>Saturday</td>
<td>320</td>
<td>60</td>
</tr>
<tr>
<td>Sunday</td>
<td>224</td>
<td>50</td>
</tr>
<tr>
<td>Totals</td>
<td>1,320</td>
<td>267</td>
</tr>
</tbody>
</table>

The final sample resulted in slightly more trips since it was decided to survey positioning trips, as well as designated sample trips.

In addition to the mode and travel day characteristics suggested by the research objectives, the sampling plans for the on-board surveys proposed further subdividing the
system into groups defined by service corridor and type, time of day and direction of travel. This stratification was proposed to improve sample accuracy.

1.1.2 Procedures Development

The on-board survey required development of well documented procedures for data collection and control. Because of the complexity of the on-board surveyor's duties, a special manual was prepared for use by on-board personnel. Procedures developed included sample selection, control system design, and data editing and error resolution.

1.1.2.1 On-board Surveyor's Manual

The on-board surveyor's manual described every aspect of the surveyor's job, from administrative matters through safeguarding data and courtesy to the public. In addition, tips on how to do the job accurately and efficiently were included. The manual described the equipment the surveyor would use, defined various terms used frequently in the conduct of the study, and included a section specifically detailing on-board procedures. These included when and where to arrive for the assigned survey; installation of survey equipment; and a description of the various data collection procedures. The material contained in the manual was reviewed extensively with each surveyor during a mandatory training session. The surveyors were instructed to carry their manual with them over the course of the survey, so they could refer to it if there were questions. In addition, each surveyor was given the phone numbers and contact names of everyone working in the survey management office, in case they had a problem or needed help.

1.1.2.2 Sample Selection

GH&A staff enumerated all train and bus trips expected to be in operation during the survey period (the universe) by stratum (day, time period, service type and corridor, and direction). Then trips were selected randomly. Each trip was considered for sampling independently, with equal probability of selection. When possible, trips were
selected in inbound/outbound block pairs to effect some efficiency in scheduling surveyors.

1.1.2.3 Survey Instrument and Control Log Design

Two survey instruments were designed and pre-tested for the on-board survey. Based on the results of the pre-test, the instrument shown in Exhibit 1-1 was chosen. The questionnaire was printed on card stock, serially numbered for control, and contained a postage paid mail-back feature.

Control logs, used to collect relevant survey control data, were generated automatically by the survey scheduling system developed by GH&A and customized for the project. (Examples of these are shown in Section 1.2.) Bus surveyors were required to enumerate passengers by gender/race group (for response bias adjustment) and record serial numbers by bus trip segment. For the rail survey, surveyors were required to enumerate total boardings and record card serial numbers at each stop. Response bias control for the on-board rail survey was developed as part of the mode of arrival survey.

1.1.3 Survey Preparation

Several tasks comprised the survey preparation phase of the project. First, GH&A procured all the necessary equipment and supplies for the field work. Next, GH&A subcontracted with a local temporary staffing firm to provide the necessary personnel (surveyors, editors and coders) for the project.

Surveyors were required to attend a classroom training session to become familiar with survey procedures. Secondly, they were required to attend a "live" training session where they actually performed survey work.

Next, data collection schedules were developed. These schedules, along with other relevant information, were loaded into a specially adapted version of GH&A's Survey
Dear MARTA Passenger:

Please take a minute to help us plan for your transit needs by filling out this survey. Place the completed card in the special box located near the exit door of this vehicle or drop it in any mailbox. No postage necessary.

Please fill out this survey even if you filled one out before. THANK YOU FOR YOUR HELP.

WHERE DID YOU COME FROM BEFORE THIS ONE-WAY TRIP? (Check only one)
- [ ] Work
- [ ] Home
- [ ] Shopping
- [ ] Medical Appointment
- [ ] College
- [x] School, Church, or Personal Business
- [ ] Other (describe)

WHERE IS THAT PLACE?
- [ ] Address, Nearest Street Corner, or Building Name
- [ ] City NE NW SE SW
- [ ] Zip Code

HOW DID YOU PAY FOR THIS ONE-WAY TRIP? (Check only one)
- [ ] Token
- [ ] Weekly Transfer
- [ ] Monthly Transfer
- [ ] Cash
- [x] Cobb County Transfer
- [x] Other (describe)

HOW DID YOU GET TO YOUR FIRST BUS OR TRAIN? (Check only one)
- [ ] walked or rode a bike
- [ ] rode with someone who picked
- [ ] rode in a cab, taxi, or limousine
- [ ] was dropped off by someone

WHAT BUSES AND TRAINS DO YOU USE ON THIS ONE-WAY TRIP?
Describe each part of this trip in order from beginning to end on a separate line. Write down the route number of every bus and each place you change buses or trains.

1. First, I ride
   - [ ] a train from
   - [ ] a bus route from
   - [ ] station, address, nearest street corner, or building name

2. Then, I ride
   - [ ] a train from
   - [ ] a bus route from
   - [ ] station, address, nearest street corner, or building name

3. Then, I ride
   - [ ] a train from
   - [ ] a bus route from
   - [ ] station, address, nearest street corner, or building name

4. Then, I ride
   - [ ] a train from
   - [ ] a bus route from
   - [ ] station, address, nearest street corner, or building name

5. Then, I ride
   - [ ] a train from
   - [ ] a bus route from
   - [ ] station, address, nearest street corner, or building name

WHERE WILL YOU GET OFF YOUR LAST BUS OR TRAIN?
- [ ] Address, Nearest Street Corner, or Building Name
- [ ] City NE NW SE SW
- [ ] Zip Code

HOW WILL YOU LEAVE THAT PLACE? (Check only one)
- [ ] Walked or rode a bike
- [ ] rode with someone who picked
- [ ] rode in a taxi
- [ ] was picked up by someone

WHERE ARE YOU GOING AFTER THIS ONE-WAY TRIP? (Check only one)
- [ ] Work
- [ ] Home
- [ ] Shopping
- [ ] College
- [ ] School, Church, or Personal Business
- [ ] Other (describe)

WHERE IS THAT PLACE?

HOW MANY DAYS A WEEK DO YOU MAKE THIS KIND OF TRIP ON MARTA?
- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6
- [ ] 7
- [ ] Don't go every week

WHERE ARE YOU LIVING NOW?
- [ ] Address, Nearest Street Corner, or Building Name
- [ ] City NE NW SE SW
- [ ] Zip Code

HOW MANY PEOPLE LIVE WITH YOU? (Include yourself)

HOW MANY WORKING MOTOR VEHICLES ARE THERE?

COULD YOU HAVE MADE THIS TRIP ANOTHER WAY?
- [ ] No
- [ ] Yes, I could have driven
- [x] Yes, I could have ridden with someone

I AM:
- [ ] Male
- [x] Female

I AM:
- [ ] Black
- [ ] White
- [ ] Hispanic
- [ ] Other

MY AGE IS:
- [ ] Under 18
- [ ] 18 - 24
- [ ] 25 - 34
- [ ] 35 - 44
- [ ] 45 - 54
- [ ] 55 - 64
- [ ] 65 or over

THE COMBINED TOTAL INCOME OF EVERYONE LIVING AT MY HOME IS:
- [ ] Less than $6,000
- [ ] $6,000 - $9,999
- [ ] $10,000 - $14,999
- [x] $15,000 - $19,999
- [ ] $20,000 - $24,999
- [ ] $25,000 - $29,999
- [ ] $30,000 or more

HOW LONG HAVE YOU BEEN USING MARTA?
- [ ] Less than 1 month
- [ ] 1-6 months
- [ ] 7-12 months
- [x] Over 12 months

Thank you again. If you need help, ask the person who handed you this card.
Management Support System (SMSS). This computerized system generated all control logs and trip envelope labels, maintained information on schedule adherence, and provided a data entry environment for capturing survey results. Related systems tracked and verified sample compliance and controlled disposition of serially numbered questionnaires.

1.2 DATA COLLECTION AND ANALYSIS

GH&A staff arrived in Atlanta on October 8, 1989 to set up the field office to manage the data collection phase of the project. Actual field work for the on-board survey was conducted between October and December 1989.

1.2.1 Data Collection Activities

GH&A staff established the survey management office at MARTA one week prior to the actual data collection. At least one of our staff members was on-site every day the survey was in the field, and on-call every hour a surveyor was scheduled to work. During the week prior to the survey, the staff ordered last minute survey supplies, assembled surveyor kits and prepared the daily work schedules. As assignments were prepared, card decks and serial number ranges allocated to each assignment were entered into the SMSS deck/serial database. It was also during this first week that temporary personnel were hired and trained.

The job of the on-board surveyor was to hand out survey questionnaires to boarding passengers on their assigned bus or train trip. When necessary, surveyors provided assistance to passengers in completing the questionnaire. In addition to this, surveyors were required to either count passengers as they boarded (for rail), or enumerate passengers by gender and race (for bus). They recorded these data on their Assignment Control Log.
There were two Assignment Control Logs - one for the bus and one for the rail (see Exhibits 1-2 and 1-3). These forms are presented in reduced form. The original size was 8 1/2 by 14 inches. The two logs were similar, both in form and detail. The front page of the control log was used by the surveyor to record the range of questionnaires used on each assignment. At specified locations, the surveyor was required to write down the serial number of the next card to be issued and record passenger boardings on the trip detail page.

Completed work was reviewed daily to identify any surveyors with problems. Surveyors that performed below expected levels of accuracy were individually retrained. Surveyors who consistently produced faulty work were dismissed.

1.2.2 Data Editing

As survey assignments were returned from the field, they were reviewed to ensure that the work was successfully completed and that all survey materials were returned. Following that, all data from the completed control logs were immediately keyed into the appropriate control logs data base. Then an edit program was applied to validate the surveyor's work. The resulting edit report provided feedback on surveyor performance, and formed the basis for error resolution.

Once all errors were resolved, the edit program updated other survey files to reflect the current status of each assignment. The program also generated control records, including issued serial number ranges by assignment, trip, and time period. These records were used to associate passenger response records (by serial number) with the assignment where they were issued.

After this association, all records were passed through a second level edit program. This program flagged any inconsistencies between data contained in the control records and data coded or entered in individual response records. For example, this program
EXHIBIT 1-2: CARD SERIAL NUMBER LOG, BUS

<table>
<thead>
<tr>
<th>MARTA Fall 1989 BUS Passenger Survey Assignment Control Log</th>
<th>Weekday Assignment A501, Page 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report to: 4TH ST &amp; MANOR DR PARK &amp; RI at: 4:43 AM</td>
<td>Surveyor's Name: ______________</td>
</tr>
<tr>
<td>Board Route 120, Block 3 Bus</td>
<td>Date: __________ Weather: __________</td>
</tr>
<tr>
<td>BEGIN SURVEY IMMEDIATELY</td>
<td>Editor's Name: ________________</td>
</tr>
</tbody>
</table>

Record the first and last Serial Number of every card deck OPENED on this assignment:

<table>
<thead>
<tr>
<th>Deck</th>
<th>Top Card Serial Number</th>
<th>Bottom Card Serial Number</th>
<th>Deck</th>
<th>Top Card Serial Number</th>
<th>Bottom Card Serial Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>__________</td>
<td>__________</td>
<td>4</td>
<td>__________</td>
<td>__________</td>
</tr>
<tr>
<td>2</td>
<td>__________</td>
<td>__________</td>
<td>5</td>
<td>__________</td>
<td>__________</td>
</tr>
<tr>
<td>3</td>
<td>__________</td>
<td>__________</td>
<td>6</td>
<td>__________</td>
<td>__________</td>
</tr>
</tbody>
</table>

TRANSFER INSTRUCTIONS:

Surveyor's Comments:

IF YOU HAVE PROBLEMS OR QUESTIONS, CALL 848-5309 (DAY) OR 239-0677 Ext 811 (NIGHT)
### Exhibit 1-2: Trip Detail Page, Bus

<table>
<thead>
<tr>
<th>Lv. 4th St &amp; Manor Dr Park &amp; Ride</th>
<th>Assignment A501, Trip 5176, Page 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule Time 5:03 AM</td>
<td>BF</td>
</tr>
<tr>
<td>Route 120, Block 3</td>
<td>BM</td>
</tr>
<tr>
<td>Actual Time: M</td>
<td>WF</td>
</tr>
<tr>
<td>Card Number</td>
<td>WM</td>
</tr>
<tr>
<td></td>
<td>OF</td>
</tr>
<tr>
<td></td>
<td>ON</td>
</tr>
</tbody>
</table>

Ar. E Ponce De Leon & N Clarendon

| Schedule Time 5:03 AM             | BF                                  |
| Actual Time: M                    | BM                                  |
| Card Number                       | WF                                  |
|                                  | WM                                  |
|                                  | OF                                  |
|                                  | ON                                  |

**End of Line**

Ar. Avondale Station (North)

| Actual Time: M                    | Card Number: |
EXHIBIT 1-3: CARD SERIAL NUMBER LOG, RAIL

MARTA Fall 1989 RAIL Passenger Survey Assignment Control Log

Report to: Hightower at: 4:31 PM
Board Train 110, Car 2 on the EASTBOUND track BEGIN SURVEY IMMEDIATELY

Weekday Assignment A038, Page 1

Surveyor's Name: ____________________  Date: _____  Weather: ____________
Editor's Name: ________________________

Record the first and last Serial Number of every card deck OPENED on this assignment

<table>
<thead>
<tr>
<th>Deck</th>
<th>Top Card Serial Number</th>
<th>Bottom Card Serial Number</th>
<th>Deck</th>
<th>Top Card Serial Number</th>
<th>Bottom Card Serial Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TRANSFER INSTRUCTIONS:

Surveyor's Comments:

IF YOU HAVE PROBLEMS OR QUESTIONS, CALL 848-5309 (DAY) OR 239-0677 Ext 811 (NIGHT)
### Exhibit 1-3: Trip Detail Page, Rail

<table>
<thead>
<tr>
<th>Station</th>
<th>Schedule</th>
<th>Actual Time</th>
<th>Card Number</th>
<th>Board</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lv. Hightower</td>
<td>4:51 PM</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. West Lake</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Ashby</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Vine City</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Omni</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Five Points</td>
<td>5:00 PM</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Georgia State</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. King Memorial</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Inman Park/Reynoldstown</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Edgewood/Candler Park</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. East Lake</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Decatur</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>END OF LINE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ar. Avondale</td>
<td>5:14 PM</td>
<td>_ _ : _ _ _ M</td>
<td>_ _ _ _</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

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validated that the coded "stop on" for each numbered response was consistent with the location of the bus (or train) at the time the response card was issued, and validated that the coded "stop off" was down-line from the issue point.

1.2.3 Sample Weighting and Validation

Once all data inconsistencies were resolved, sample data were weighted to represent all target MARTA patrons. The methods used to weight the two components of the on-board survey are described below.

1.2.3.1 On-board Rail Survey

All weighting of on-board rail survey data was performed by boarding station at the stratum level (day type, time period and direction). Initially, sampled train-car boardings were accumulated by station/stratum. Then, station/stratum total sampled boardings were weighted to estimate station/stratum train-car boardings. The weighting factor was:

\[
\text{Weight}(1) = \frac{\text{Station/stratum train-car trips}}{\text{Sampled station/stratum train-car trips}}
\]

This provided an estimate of total boardings by station/stratum. This factor was applied at the station level and was sensitive to both consist length and train turn-backs.

Then, valid responses by station/stratum were weighted to represent all station/stratum train-car boardings. The weighting factor was:

\[
\text{Weight}(2) = \frac{\text{Station/stratum train-car boardings}}{\text{Station/stratum valid responses}}
\]

Weight(2) represented the initial weight for most responses. Travel patterns indicating
a rail-to-rail transfer at Five Points were given the average of their originating station weight(2) and the appropriate Five Points weight(2).

Following initial weighting, all responses were weighted to eliminate response bias. This weight was derived from the mode of arrival survey counts and applied by station, day type and time period.

1.2.3.2 On-board Bus Survey

All weighting of on-board bus survey data was performed at the stratum level (day type, route/service type group, time period and direction). Initially, sampled bus trip boardings were accumulated by stratum. Then, stratum total sampled boardings were weighted to estimate stratum bus trip boardings. The weighting factor was:

\[
\text{Weight}(1) = \frac{\text{Stratum bus trips}}{\text{Sampled stratum bus trips}}
\]

Then, valid responses by stratum were weighted to represent stratum boardings. The weighting factor was:

\[
\text{Weight}(2) = \frac{\text{Stratum bus trip boardings}}{\text{Stratum valid responses}}
\]

Weight(2) represented the initial weight for most responses. Response travel patterns indicating more than one bus boarding were re-weighted to reflect the additional boardings (i.e., the initial weight was divided by the number of boardings reported).

Next, all responses were weighted to eliminate response bias. This weight was derived from bus boarding counts and applied by day type, route/service type group and \( \dagger \).

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direction. In addition, a final adjustment was applied to balance inbound and outbound bus travel by day type.

1.2.3.3 Combined On-board Survey File

The rail and bus on-board survey files provided two independent estimates of MARTA patronage. Passengers using only one mode (i.e., rail or bus) required no additional weighting. However, passengers using both modes were double counted. In order to remove this undesirable effect, responses from either survey which indicated a bus-to-rail or rail-to-bus transfer were adjusted. This final adjustment was:

\[ \text{Weight}(3) = \frac{\text{Weight}(2)}{2} \]

Following this final adjustment, a combined file of survey records from both surveys was produced. The record format for this file and information regarding its use are contained in Appendix B. All on-board survey related information contained in Section 1.3 of this report was produced using the final weight from this file.

Once these files were combined, survey estimated patronage was:

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Rail Boardings</th>
<th>Rail Trips</th>
<th>Bus Boardings</th>
<th>Bus Trips</th>
<th>System Boardings</th>
<th>System Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>252,094</td>
<td>198,606</td>
<td>230,655</td>
<td>145,014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td>128,651</td>
<td>100,671</td>
<td>135,401</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td>57,829</td>
<td>47,343</td>
<td>59,627</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These results compared favorably with other independent data sources maintained by MARTA.

1.2.4 Geographic Coding of Addresses

The on-board survey questionnaire sought to determine a full description of each
passenger's travel pattern on MARTA trains and/or buses. This could produce as many as nine separate geographic reference points (addresses) for a single response. In all, over 50,000 addresses were produced. These were analyzed and coded to census tract-block. Address matching for non-rail station points was performed by the Atlanta Regional Commission. Address verification and cleanup was performed by GH&A staff. The format of the geocoded address file is contained in Appendix B.

1.3 SUMMARY OF RESULTS

The research goal and objectives for this project are restated in Exhibit 1-4. The exhibits which follow were prepared to provide data relevant to each objective. Many other tabulations of survey data providing more detailed, cross sectional analysis were delivered to MARTA Research staff separately.

1.3.1 General Ridership Characteristics

Exhibits 1-5 through 1-17 describe the general characteristics of MARTA's patrons based on analysis of the results of the on-board bus and rail survey. The data in these exhibits address Research Objective 1. Frequency distributions are presented for the following variables: fare payment method, combined trip purpose, trip frequency, household size, auto availability, alternative methods of travel, gender, race, age, income, length of time using MARTA, mode of access, and mode of egress. Separate statistics are presented for weekday, Saturday and Sunday observations. The percents contained in the text of this section refer to the valid percent, which excludes missing observations from the calculation.

The resulting accuracy analysis is shown below. The analysis frame for these statistics is system-wide.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>±1.24%</td>
</tr>
<tr>
<td>Saturday</td>
<td>±2.63%</td>
</tr>
<tr>
<td>Sunday</td>
<td>±3.00%</td>
</tr>
</tbody>
</table>
EXHIBIT 1-4
STATEMENT OF RESEARCH GOAL AND OBJECTIVES

Goal: To learn travel characteristics, patterns, needs, and prevailing attitudes as they relate to MARTA's current level of service.

Objectives:

1. Identify General Ridership Characteristics Including:
   A. Fare Payment Method
   B. Trip Purpose
   C. Trip Frequency
   D. Demographics
   E. Attitudinal and Psychographic Data
   F. Mode of Access
   G. Mode of Egress

2. Rail Entry Analysis
   A. Average Rail Trip Length
   B. % Rail-to-Rail Transferring
   C. % Rail-to-Bus Transferring

3. Determine Total TransCard Bus Boardings
   A. % TransCard Rail-Bus Transfers Outside Stations
   B. % Transcard Bus-Bus Transfers Outside Stations

4. Determine TransCard Bus-Rail Transfers Outside Stations as a Proportion of TransCard Faregate Entries

5. Determine Percent Bus-Bus Transfers to Total Bus Linked Trips

6. Collect Mode of Access at Rail Stations by Time of Day (Auto, Bus and Pedestrian Arrivals) (SEE SECTION 2)

7. Stratify Rail Trips By:
   A. Trip Purpose
   B. Income
   C. Mode of Access to Rail Station
   D. Station of Entry
   E. Station of Egress
   F. Mode of Egress from Rail Station

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8. Origin and Destination Analysis  
   A. Trip Length Frequency by Income  
   B. Sub-Corridor Trip Movements by Income  
9. Elderly and Handicapped Analysis  
   A. Proportion of Total System Patronage  
   B. Percent of Cash Fares  
10. TransCard Analysis  
    A. Ratio of TransCard Initial Bus Boardings to Cash-fare Initial Bus Boardings  
    B. Ratio of Cash-fare Bus-to-Bus Transfers to Cash-fare Bus Initial Boardings  
    C. Ratio of TransCard Bus-to-Bus Transfers to TransCard Initial Bus Boardings  
    D. Ratio of TransCard Initial Rail Boardings to Total Rail Transcard Entries  
11. Free Intermodal Pass-Thru Analysis  
    A. % Inbound and Outbound Pass-Thrus from Area  
    B. % Inbound and Outbound Bus-to-Bus Pass-Thrus  
    C. % Ride-Thrus
Cash is the most prevalent form of payment by MARTA patrons, without regard to travel day. Almost 33% of weekday riders used cash, compared to 38.2% on Saturday and 45.1% on Sunday. The weekly transcard and token were the other predominant methods of payment. Thirty one percent of weekday riders used the weekly transcard followed by 21.2% who paid with a token. These and other statistics are presented in Exhibit 1-5.

Exhibit 1-6 presents the analysis of a computed variable, combined trip purpose. This variable represents the traditional "home based" trip purpose used in trip generation models. The results of the on-board bus and rail survey indicate that the primary trip making purpose for weekday riders is work (63.7%). The same observation is true for Saturday riders (46.9%). However, as might be expected, the primary trip making purpose on Sunday is personal business (42.0%), followed by work trips (38.6%).

Survey respondents were asked how many days a week they made similar trips using MARTA. Since work was the most frequent trip type, it is not surprising that most of the weekday and Saturday respondents answered five days/week (Weekday - 50.8%; Saturday - 25.8%). However, most Sunday respondents indicated they did not make the trip every week (22.9%). Frequency of trip making is shown in Exhibit 1-7.

The average household size of MARTA patrons is one to three members. Two-thirds of the weekday respondents stated this, compared to 65.3% of the Saturday and 61.2% of Sunday riders. Household size data are presented in Exhibit 1-8.

Survey respondents were asked how many working vehicles there were in their household. For weekday and Saturday riders, one third indicated they had no vehicle and another third indicated they had only one vehicle. A higher proportion of Sunday riders indicated zero vehicles. Passengers were also asked could they have made the trip another way, that is without MARTA. The results show that the most weekday
(43.4%) and weekend (40.5% - Saturday; 47.5% - Sunday) riders had no alternative to MARTA. Thirty eight percent of the remaining weekday riders indicated they could have driven, compared to 36.5% of Saturday riders and 35.0% of Sunday riders. The frequencies and percents for these two variables are presented in Exhibits 1-9 and 1-10, respectively.

Demographic data are presented in Exhibits 1-11 through 1-14. The largest percentage of MARTA riders are black males, between the ages of 25 and 39. Survey respondents were asked to report their annual household income. More than one-fourth of the weekday and Saturday respondents indicated they made $35,000 or more per year. However, 24.4% of survey respondents from Sunday reported their annual income to be between $15,000 to $24,999. Riders with low household incomes (less than $15,000/year) are significant. Almost 30% of the weekday riders and over 35% of the weekend riders report income at this level.

When asked how long had they been using MARTA, the majority of respondents indicated over 12 months (68.3% - Weekday; 75.6% - Saturday; 70.8% - Sunday). The next largest group was between 1 and 6 months. These statistics can be found in Exhibit 1-15.

Data relating to mode of access and mode of egress are presented in Exhibits 1-16 and 1-17, respectively. More than three fourths of weekday riders indicated they walked or rode a bike to or from MARTA. A similarly high number of Saturday and Sunday respondents answered in the same manner. Other significant means of access or egress were to drive or be dropped off.

1.3.2 Rail Entry Analysis

Research Objective 2A requires an analysis of the average rail trip length. The
table below summarizes the overall average trip length and accuracy by day. All rail patrons is used as the analysis frame for these statistics.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Mean Length</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>7.08 mi</td>
<td>±1.52%</td>
</tr>
<tr>
<td>Saturday</td>
<td>6.81 mi</td>
<td>±3.78%</td>
</tr>
<tr>
<td>Sunday</td>
<td>7.49 mi</td>
<td>±4.08%</td>
</tr>
</tbody>
</table>

Data on rail-to-rail transfer percents are presented in the table below, and respond to Research Objective 2B. These were derived from Exhibit 1-30.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Rail Patrons</th>
<th>Transfers</th>
<th>Rail-Rail</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>198,606</td>
<td>53,488</td>
<td>26.93</td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td>100,671</td>
<td>27,980</td>
<td>27.79</td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td>47,343</td>
<td>10,486</td>
<td>22.15</td>
<td></td>
</tr>
</tbody>
</table>

Rail-to-MARTA bus transfer percents are provided below, and respond to Research Objective 2C. These were derived from Exhibit 1-30.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Rail Patrons</th>
<th>Transfers</th>
<th>Rail-Bus</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>198,606</td>
<td>82,881</td>
<td>41.73</td>
<td></td>
</tr>
<tr>
<td>Saturday</td>
<td>100,671</td>
<td>39,991</td>
<td>39.72</td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td>47,343</td>
<td>16,552</td>
<td>34.96</td>
<td></td>
</tr>
</tbody>
</table>

The resulting accuracy for both sets of statistics is presented below. Rail patrons is the analysis frame.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>±1.23%</td>
</tr>
<tr>
<td>Saturday</td>
<td>±2.70%</td>
</tr>
<tr>
<td>Sunday</td>
<td>±3.04%</td>
</tr>
</tbody>
</table>
1.3.3 TransCard Rail-Bus Transfers

Research Objective 3A addresses the percent TransCard Rail-outside bus transfers related to Transcard initial bus boardings. The analysis is provided below, and is only relevant to free intermodal stations. This data was derived from Exhibit 1-18, which describes outside transfers and initial bus boardings for all fare types.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>TransCard Rail-Outside Bus</th>
<th>TransCard Initial Bus Boardings</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>15,249</td>
<td>62,880</td>
<td>24.25</td>
</tr>
<tr>
<td>Saturday</td>
<td>11,457</td>
<td>37,353</td>
<td>30.67</td>
</tr>
<tr>
<td>Sunday</td>
<td>2,373</td>
<td>14,821</td>
<td>16.01</td>
</tr>
</tbody>
</table>

1.3.4 TransCard Bus-Bus Transfers

Research Objective 3B addresses the percent TransCard bus-outside bus transfers related to Transcard initial bus boardings. The analysis is provided below, and is only relevant to free intermodal stations. This data was derived from Exhibit 1-18, which describes outside transfers and initial bus boardings for all fare payment methods.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>TransCard Outside-Outside Bus</th>
<th>TransCard Initial Bus Boardings</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>6,941</td>
<td>62,880</td>
<td>11.04</td>
</tr>
<tr>
<td>Saturday</td>
<td>2,387</td>
<td>37,353</td>
<td>6.39</td>
</tr>
<tr>
<td>Sunday</td>
<td>2,400</td>
<td>14,821</td>
<td>16.19</td>
</tr>
</tbody>
</table>

1.3.5 Faregate Entries

Research Objective 4A is to determine the Transcard bus-rail transfers outside stations as a percent of Transcard faregate entries. The analysis is provided below, and is only relevant at free intermodal stations. This data was derived from Exhibit 1-18, which describes all outside transfers and faregate entries by fare type.

1-21
<table>
<thead>
<tr>
<th>Day Type</th>
<th>TransCard Outside-Bus-Rail</th>
<th>TransCard Gate Entries</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>17,139</td>
<td>61,913</td>
<td>27.68</td>
</tr>
<tr>
<td>Saturday</td>
<td>8,646</td>
<td>32,637</td>
<td>26.49</td>
</tr>
<tr>
<td>Sunday</td>
<td>3,139</td>
<td>11,681</td>
<td>26.87</td>
</tr>
</tbody>
</table>

1.3.6 Bus-Bus Transfers and Bus Linked Trips

Data on MARTA bus-to-bus transfer percents are provided below. These were derived from Exhibit 1-30, and respond to Research Objective 5.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Bus Patrons</th>
<th>Bus-Bus Transfers</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>130,648</td>
<td>17,190</td>
<td>13.16</td>
</tr>
<tr>
<td>Saturday</td>
<td>83,184</td>
<td>12,645</td>
<td>15.20</td>
</tr>
<tr>
<td>Sunday</td>
<td>37,184</td>
<td>6,440</td>
<td>17.32</td>
</tr>
</tbody>
</table>

The resulting accuracy for this analysis is presented below at the 95% confidence interval. Passengers initially using bus is the analysis frame.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>±1.82%</td>
</tr>
<tr>
<td>Saturday</td>
<td>±4.08%</td>
</tr>
<tr>
<td>Sunday</td>
<td>±4.86%</td>
</tr>
</tbody>
</table>

1.3.7 Stratification of Rail Trips

Exhibits 1-19 through 1-24 provide profiles of the requested attributes for MARTA's rail patrons. The data in these exhibits address Research Objective 7. Frequency distributions are presented for the following variables: combined trip purpose, income, mode of access, station of entry, station of exit and mode of egress. Separate statistics are presented for weekday, Saturday and Sunday observations. The percents presented in the text of this section refer to the valid percent, which excludes missing observations from the calculation.
The resulting accuracy is consistently better than required by the Research Objectives. The analysis frame for these statistics is patrons using rail.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>±1.23%</td>
</tr>
<tr>
<td>Saturday</td>
<td>±2.70%</td>
</tr>
<tr>
<td>Sunday</td>
<td>±3.04%</td>
</tr>
</tbody>
</table>

The weekday and Saturday rail patrons that participated in the on-board survey indicated that their primary trip making purpose was work. Almost two-thirds of the weekday respondents indicated work, compared to 45.4% for Saturday. The primary trip making purpose on Sunday was personal business (45.3%), followed by work (38.2%). These data are presented in Exhibit 1-19.

The income profile of the rail patron is similar to the average MARTA bus and rail patron. That is, the majority of the rail respondents indicated their annual household income was $35,000 or more. This observation is consistent for weekday and weekend riders. Income statistics are presented in Exhibit 1-20.

The primary mode of access for rail respondents, Exhibit 1-21, is walking or riding a bike, followed by driving and being dropped off. Almost 80% of weekday riders indicated they walked to MARTA, compared to 78.4% for Saturday and 73.5% for Sunday.

The Five Points rail station serves Atlanta's downtown business district with direct access to all rail lines. Therefore, it is not surprising that Five Points is the prevalent station of entry and exit for all rail patrons, without regard to survey day type. For weekday and Saturday survey respondents, Chamblee, Lenox, Hightower and Avondale are also frequent stations of entry and exit. On Sunday, the Airport is the second most frequent rail station of entry and exit. Data on station of entry and exit are presented in Exhibits 1-22 and 1-23, respectively.
Exhibit 1-24 presents the frequency and percents for the variable mode of egress. The observation for mode of egress is similar to that for mode of access. That is, most rail patrons indicated they walked or rode their bike to their destination after exiting MARTA. This is followed by either driving a car or being dropped off by someone.

1.3.8 Origin and Destination Analysis

Rail trip length by income group is shown in Exhibit 1-25. The data in this exhibit addresses Research Objective 8A. The accuracy analysis for this data is included in the exhibit and is calculated at the 95% confidence interval, with patrons using rail as the analysis frame.

Research Objective 8B, patrons by line and income group, is addressed in Exhibit 1-26. Caution should be used in analyzing these data, since transferring passengers are counted twice, once on their "from line" and again on their "to line".

1.3.9 Elderly and Handicapped Analysis

Research Objective 9 relates to elderly and handicapped patrons. Specifically, the requirements are to provide the proportion of elderly and handicapped riders to total system patrons and as a percentage of cash fares. The statistics are provided below, and are derived from Exhibit 1-5.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>E&amp;H Patrons</th>
<th>System Patrons</th>
<th>%</th>
<th>Cash Patrons</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>4,077</td>
<td>246,016</td>
<td>1.66</td>
<td>80,224</td>
<td>5.08</td>
</tr>
<tr>
<td>Saturday</td>
<td>2,591</td>
<td>145,014</td>
<td>1.79</td>
<td>55,376</td>
<td>4.68</td>
</tr>
<tr>
<td>Sunday</td>
<td>456</td>
<td>68,070</td>
<td>0.67</td>
<td>30,673</td>
<td>1.49</td>
</tr>
</tbody>
</table>

The resulting accuracy of the worst case proportion (.5) at the 95% confidence interval is shown below. The analysis frame for these statistics is system-wide.
Day Type | Accuracy
---|---
Weekday | ±1.21%
Saturday | ±2.63%
Sunday | ±3.00%

1.3.10 TransCard Analysis

The ratios from the Transcard analyses are provided below. These were derived from Exhibits 1-27 and 1-28. These data correspond to Research Objective 10.

### 10A.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>TransCard Initial Bus Boardings</th>
<th>Cash-fare Initial Bus Boardings</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>62,880</td>
<td>50,173</td>
<td>1.2533</td>
</tr>
<tr>
<td>Saturday</td>
<td>37,353</td>
<td>34,617</td>
<td>1.0790</td>
</tr>
<tr>
<td>Sunday</td>
<td>14,821</td>
<td>19,376</td>
<td>.7649</td>
</tr>
</tbody>
</table>

### 10B.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Cash-fare Bus-to Bus Transfers</th>
<th>Cash-fare Initial Bus Boardings</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>5,226</td>
<td>50,173</td>
<td>.1042</td>
</tr>
<tr>
<td>Saturday</td>
<td>4,895</td>
<td>34,617</td>
<td>.1414</td>
</tr>
<tr>
<td>Sunday</td>
<td>2,963</td>
<td>19,376</td>
<td>.1529</td>
</tr>
</tbody>
</table>

### 10C.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>TransCard Bus-to Bus Transfers</th>
<th>TransCard Initial Bus Boardings</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>8,905</td>
<td>62,880</td>
<td>.1416</td>
</tr>
<tr>
<td>Saturday</td>
<td>3,688</td>
<td>37,353</td>
<td>.0987</td>
</tr>
<tr>
<td>Sunday</td>
<td>3,478</td>
<td>14,821</td>
<td>.2347</td>
</tr>
</tbody>
</table>

The resulting accuracy for these various statistics is presented below. The analysis frame for this is initial bus users.

Day Type | Accuracy
---|---
Weekday | ±1.82%
Saturday | ±4.08%
Sunday | ±4.86%
Research Objective 10D relates to rail data, as opposed to the bus. The ratio of Transcard initial rail boardings to total rail Transcard Entries is shown below.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>TransCard Initial Rail Boardings</th>
<th>Total Rail TransCard Entries</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>43,644</td>
<td>85,645</td>
<td>.5096</td>
</tr>
<tr>
<td>Saturday</td>
<td>19,262</td>
<td>37,592</td>
<td>.5124</td>
</tr>
<tr>
<td>Sunday</td>
<td>7,893</td>
<td>13,921</td>
<td>.5670</td>
</tr>
</tbody>
</table>

The resulting accuracy for this analysis is presented below. The analysis frame for this is total rail users.

<table>
<thead>
<tr>
<th>Day Type</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday</td>
<td>±1.23%</td>
</tr>
<tr>
<td>Saturday</td>
<td>±2.70%</td>
</tr>
<tr>
<td>Sunday</td>
<td>±3.04%</td>
</tr>
</tbody>
</table>

1.3.11 Free Intermodal Pass-Thru Analysis

Exhibit 1-29 provides a complete analysis of passenger movements from and to free intermodal buses. Data contained in this exhibit responds to Research Objectives 11A through 11C.

Much of the data for Exhibit 1-29 came from Exhibit 1-30. In addition, while not specifically called for by any Research Objective, Exhibit 1-30 describes movements through other rail stations (i.e., not free intermodal stations), non-rail station places and all places combined.
EXHIBIT 1-5
TYPE OF FARE PAID

WEEKDAY Responses

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOKEN</td>
<td>1</td>
<td>52062</td>
<td>21.2</td>
<td>21.2</td>
</tr>
<tr>
<td>WEEKLY TCARD</td>
<td>2</td>
<td>76282</td>
<td>31.0</td>
<td>31.1</td>
</tr>
<tr>
<td>MONTHLY TCARD</td>
<td>3</td>
<td>30241</td>
<td>12.3</td>
<td>12.3</td>
</tr>
<tr>
<td>E-H PASS</td>
<td>4</td>
<td>4077</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>CASH</td>
<td>5</td>
<td>80224</td>
<td>32.6</td>
<td>32.7</td>
</tr>
<tr>
<td>COBB CO XFER</td>
<td>6</td>
<td>780</td>
<td>.3</td>
<td>.3</td>
</tr>
<tr>
<td>OTHER</td>
<td>7</td>
<td>1947</td>
<td>.8</td>
<td>.8</td>
</tr>
<tr>
<td>.</td>
<td>8</td>
<td>404</td>
<td>.2</td>
<td>Missing</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>246016</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

Valid cases 245612  Missing cases 404

SATURDAY Responses

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOKEN</td>
<td>1</td>
<td>28337</td>
<td>19.5</td>
<td>19.5</td>
</tr>
<tr>
<td>WEEKLY TCARD</td>
<td>2</td>
<td>49311</td>
<td>34.0</td>
<td>34.0</td>
</tr>
<tr>
<td>MONTHLY TCARD</td>
<td>3</td>
<td>7303</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>E-H PASS</td>
<td>4</td>
<td>2591</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>CASH</td>
<td>5</td>
<td>55376</td>
<td>38.2</td>
<td>38.2</td>
</tr>
<tr>
<td>COBB CO XFER</td>
<td>6</td>
<td>719</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>OTHER</td>
<td>7</td>
<td>1377</td>
<td>.9</td>
<td>.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>145014</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

Valid cases 145014  Missing cases 0

SUNDAY Responses

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOKEN</td>
<td>1</td>
<td>13588</td>
<td>20.0</td>
<td>20.0</td>
</tr>
<tr>
<td>WEEKLY TCARD</td>
<td>2</td>
<td>15446</td>
<td>22.7</td>
<td>22.7</td>
</tr>
<tr>
<td>MONTHLY TCARD</td>
<td>3</td>
<td>7268</td>
<td>10.7</td>
<td>10.7</td>
</tr>
<tr>
<td>E-H PASS</td>
<td>4</td>
<td>456</td>
<td>.7</td>
<td>.7</td>
</tr>
<tr>
<td>CASH</td>
<td>5</td>
<td>30673</td>
<td>45.1</td>
<td>45.1</td>
</tr>
<tr>
<td>OTHER</td>
<td>7</td>
<td>639</td>
<td>.9</td>
<td>.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>68070</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

Valid cases 68070  Missing cases 0

1-27
### EXHIBIT 1-6
**COMBINED TRIP PURPOSE**

#### WEEKDAY Responses

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORK</td>
<td>1.00</td>
<td>156591</td>
<td>63.7</td>
<td>63.7</td>
</tr>
<tr>
<td>SHOPPING</td>
<td>3.00</td>
<td>13270</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>MEAL</td>
<td>4.00</td>
<td>2014</td>
<td>.8</td>
<td>.8</td>
</tr>
<tr>
<td>MEDICAL</td>
<td>5.00</td>
<td>3653</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>COLLEGE</td>
<td>6.00</td>
<td>26538</td>
<td>10.8</td>
<td>10.8</td>
</tr>
<tr>
<td>PERSONAL</td>
<td>7.00</td>
<td>32976</td>
<td>13.4</td>
<td>13.4</td>
</tr>
<tr>
<td>OTHER SCHOOL</td>
<td>8.00</td>
<td>10952</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>OTHER</td>
<td>9.00</td>
<td>5</td>
<td>.0</td>
<td>.0</td>
</tr>
<tr>
<td>.</td>
<td>18</td>
<td>.0</td>
<td>Missing</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>246016</td>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Valid cases 245998  Missing cases 18

#### SATURDAY Responses

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORK</td>
<td>1.00</td>
<td>67962</td>
<td>46.9</td>
<td>46.9</td>
</tr>
<tr>
<td>HOME</td>
<td>2.00</td>
<td>92</td>
<td>.1</td>
<td>.1</td>
</tr>
<tr>
<td>SHOPPING</td>
<td>3.00</td>
<td>32905</td>
<td>22.7</td>
<td>22.7</td>
</tr>
<tr>
<td>MEAL</td>
<td>4.00</td>
<td>1643</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>MEDICAL</td>
<td>5.00</td>
<td>728</td>
<td>.5</td>
<td>.5</td>
</tr>
<tr>
<td>COLLEGE</td>
<td>6.00</td>
<td>4027</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>PERSONAL</td>
<td>7.00</td>
<td>36372</td>
<td>25.1</td>
<td>25.1</td>
</tr>
<tr>
<td>OTHER SCHOOL</td>
<td>8.00</td>
<td>1238</td>
<td>.9</td>
<td>.9</td>
</tr>
<tr>
<td>.</td>
<td>47</td>
<td>.0</td>
<td>Missing</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>145014</td>
<td></td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Valid cases 144966  Missing cases 47

#### SUNDAY RESPONSES

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORK</td>
<td>1.00</td>
<td>26270</td>
<td>38.6</td>
<td>38.6</td>
</tr>
<tr>
<td>SHOPPING</td>
<td>3.00</td>
<td>6207</td>
<td>9.1</td>
<td>9.1</td>
</tr>
<tr>
<td>MEAL</td>
<td>4.00</td>
<td>3842</td>
<td>5.6</td>
<td>5.6</td>
</tr>
<tr>
<td>MEDICAL</td>
<td>5.00</td>
<td>600</td>
<td>.9</td>
<td>.9</td>
</tr>
<tr>
<td>COLLEGE</td>
<td>6.00</td>
<td>1809</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>PERSONAL</td>
<td>7.00</td>
<td>28592</td>
<td>42.0</td>
<td>42.0</td>
</tr>
<tr>
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Valid cases 68070  Missing cases 0
### EXHIBIT 1-7
FREQUENCY OF RIDING MARTA

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Valid cases 235690 Missing cases 10326

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Valid cases 136516 Missing cases 8497

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Valid cases 65911 Missing cases 2159

1-29
EXHIBIT 1-8
HOUSEHOLD SIZE

WEEKDAY Responses

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Valid cases 233889
Missing cases 12127

SATURDAY Responses

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Valid cases 134860
Missing cases 10153

SUNDAY Responses

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### EXHIBIT 1-9
### AVAILABLE AUTOS

#### WEEKDAY Responses

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Valid cases 246016

Missing cases 0

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Valid cases 145014

Missing cases 0

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Valid cases 68047

Missing cases 23

1-31
EXHIBIT 1-10
ALTERNATIVE MODE W/ O MARTA

WEEKDAY Responses

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Valid cases 237994  
Missing cases 8022

SATURDAY Responses

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Valid cases 135876  
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Valid cases 64767  
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EXHIBIT 1-11

GENRE

WEEKDAY Responses

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Valid cases 237619  Missing cases 8397

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Valid cases 138474  Missing cases 6540

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Valid cases 64153  Missing cases 3917
## EXHIBIT 1-12

### RACE

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Valid cases 228847  
Missing cases 17169

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#### SUNDAY Responses

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Valid cases 237676

Missing cases 8340

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Valid cases 136948

Missing cases 8066

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Valid cases 65252

Missing cases 2818

1-35
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Valid cases 218588  Missing cases 27428

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## EXHIBIT 1-15
### TIME USING MARTA

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Valid cases 235750   Missing cases 10266

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Valid cases 138254   Missing cases 6760

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Valid cases 64873   Missing cases 3197
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Valid cases 145014  Missing cases 0

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Valid cases 67996  Missing cases 74

1-38
### EXHIBIT 1-17
NODE OF EGRESS

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<td>7.6</td>
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</table>

Valid cases 144428  Missing cases 586

#### SUNDAY Responses

<table>
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<tr>
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<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
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</thead>
<tbody>
<tr>
<td>WALK-BIKE</td>
<td>1</td>
<td>54559</td>
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</tr>
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<td>DRIVE</td>
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<td>4795</td>
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<td>.8</td>
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Valid cases 67670  Missing cases 400
### EXHIBIT 1-18
FARE MEDIA OF OUTSIDE TRANSFERS

#### WEEKDAY

<table>
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<tr>
<th>Media Used</th>
<th>---- Outside Transfers ----</th>
<th>Initial Bus Boardings</th>
<th>Faregate Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rail-Bus</td>
<td>Bus-Bus</td>
<td>Bus-Rail</td>
</tr>
<tr>
<td>Token</td>
<td>4522</td>
<td>141</td>
<td>3801</td>
</tr>
<tr>
<td>Weekly TC</td>
<td>13092</td>
<td>4872</td>
<td>14424</td>
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<tr>
<td>Monthly TC</td>
<td>2157</td>
<td>2069</td>
<td>2715</td>
</tr>
<tr>
<td>E/H Pass</td>
<td>886</td>
<td>714</td>
<td>862</td>
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<tr>
<td>Cash</td>
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<td>4415</td>
<td>11695</td>
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<td>12906</td>
<td>33675</td>
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#### SATURDAY

<table>
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<tr>
<th>Media Used</th>
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<th>Initial Bus Boardings</th>
<th>Faregate Entries</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Bus-Rail</td>
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<tr>
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<td>2106</td>
<td>7064</td>
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#### SUNDAY

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<th>Faregate Entries</th>
</tr>
</thead>
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<td>Bus-Rail</td>
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EXHIBIT 1-19
COMBINED TRIP PURPOSE

WEEKDAY Rail Responses

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<th>Percent</th>
<th>Value</th>
<th>Percent</th>
<th>Cum</th>
</tr>
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<tbody>
<tr>
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<td>127759</td>
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<td>9614</td>
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<td>1717</td>
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<td>28143</td>
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<td>.0</td>
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Valid cases 198588  Missing cases 18

SATURDAY Rail Responses

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<th>Cum</th>
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Valid cases 100624  Missing cases 47

SUNDAY Rail Responses

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<th>Percent</th>
<th>Value</th>
<th>Percent</th>
<th>Cum</th>
</tr>
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<td>98.4</td>
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Valid cases 47343  Missing cases 0

1-41
## Exhibit B-1
### Final Factored Short Response Record Format

#### Station Codes

<table>
<thead>
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<th>Code</th>
<th>Station Name</th>
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<tbody>
<tr>
<td>01</td>
<td>CH CHAMBLEE</td>
</tr>
<tr>
<td>02</td>
<td>BR BROOKHAVEN</td>
</tr>
<tr>
<td>03</td>
<td>LE LEXINGTON</td>
</tr>
<tr>
<td>04</td>
<td>LI LINCOLN CENTER</td>
</tr>
<tr>
<td>05</td>
<td>AR ART CENTER</td>
</tr>
<tr>
<td>06</td>
<td>MI MIDTOWN</td>
</tr>
<tr>
<td>07</td>
<td>NO NORTH AVENUE</td>
</tr>
<tr>
<td>08</td>
<td>CI CIVIC CENTER</td>
</tr>
<tr>
<td>09</td>
<td>PE PEACHTREE CENTER</td>
</tr>
<tr>
<td>10</td>
<td>GA GARTHET</td>
</tr>
<tr>
<td>11</td>
<td>WE WEST END</td>
</tr>
<tr>
<td>12</td>
<td>OA OAKLAND CITY</td>
</tr>
<tr>
<td>13</td>
<td>LA LAKEWOOD/FORT McPHERSON</td>
</tr>
<tr>
<td>14</td>
<td>EP EAST POINT</td>
</tr>
<tr>
<td>15</td>
<td>CO COLLEGE PARK</td>
</tr>
<tr>
<td>16</td>
<td>AI AIRPORT</td>
</tr>
<tr>
<td>17</td>
<td>PI FIVE POINTS</td>
</tr>
<tr>
<td>18</td>
<td>HI HIGHTOWER</td>
</tr>
<tr>
<td>19</td>
<td>WL WEST LAKE</td>
</tr>
<tr>
<td>20</td>
<td>AS ASHBY</td>
</tr>
<tr>
<td>21</td>
<td>VI VINE CITY</td>
</tr>
<tr>
<td>22</td>
<td>OM OMNI</td>
</tr>
<tr>
<td>23</td>
<td>GE GEORGIA STATE</td>
</tr>
<tr>
<td>24</td>
<td>KI KING MEMORIAL</td>
</tr>
<tr>
<td>25</td>
<td>IN INMAN PARK/REYNOLDS PARK</td>
</tr>
<tr>
<td>26</td>
<td>ED EDGECROSS/CANDLER PARK</td>
</tr>
<tr>
<td>27</td>
<td>EL EAST LAKE</td>
</tr>
<tr>
<td>28</td>
<td>DE DECATOR</td>
</tr>
<tr>
<td>29</td>
<td>AV AVONDALE</td>
</tr>
</tbody>
</table>

00 - No rail entry or exit or beyond scope of travel pattern  
99 - Off-rail board or alight point (used only in travel pattern)

#### Time Period Codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AM Peak</td>
</tr>
<tr>
<td>2</td>
<td>Midday</td>
</tr>
<tr>
<td>3</td>
<td>PM Peak</td>
</tr>
<tr>
<td>4</td>
<td>Other</td>
</tr>
<tr>
<td>1</td>
<td>Daytime (Weekday 2+3)</td>
</tr>
<tr>
<td>2</td>
<td>Other (Weekday 1+4)</td>
</tr>
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</table>

#### Line Codes

<table>
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<tr>
<th>Rail</th>
<th>Weekday Bus</th>
<th>Weekend Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>NE - East</td>
<td>SW - West</td>
</tr>
<tr>
<td>02</td>
<td>NE - North</td>
<td>SW - South</td>
</tr>
<tr>
<td>03</td>
<td>NW - West</td>
<td>NE - Local</td>
</tr>
<tr>
<td>04</td>
<td>NW - North</td>
<td>NW - Local</td>
</tr>
<tr>
<td>05</td>
<td>SE - East</td>
<td>SE - Local</td>
</tr>
<tr>
<td>06</td>
<td>SE - South</td>
<td>SW - Local</td>
</tr>
<tr>
<td>09</td>
<td>NE - All</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>NW - All</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>SE - All</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>SW - All</td>
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</table>

#### Bus Route Codes

0 - bus not used  
Marta Bus - Route Number  
Cobb Co Bus - Route Number + 500
### EXHIBIT B-2
**GEOCODED ADDRESS RECORD FORMAT**

<table>
<thead>
<tr>
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<th>Format</th>
<th>Description</th>
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<tr>
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<td>I5</td>
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<tr>
<td>6-6</td>
<td>I1</td>
<td>Source Response Address Number (1-9)</td>
</tr>
<tr>
<td>7-7</td>
<td>I1</td>
<td>Address Type (1-4)</td>
</tr>
<tr>
<td>8-55</td>
<td>A48</td>
<td>Address (see below)</td>
</tr>
<tr>
<td>56-57</td>
<td>A2</td>
<td>Quadrant</td>
</tr>
<tr>
<td>58-67</td>
<td>A10</td>
<td>City/Town/Village Name</td>
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<td>I5</td>
<td>Zip Code</td>
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<td>I5</td>
<td>1st Census Tract</td>
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<td>78-80</td>
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<td>&quot; Block</td>
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<td>81-85</td>
<td>I5</td>
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<td>86-88</td>
<td>I3</td>
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<td>89-93</td>
<td>I5</td>
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<td>94-96</td>
<td>I3</td>
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<td>97-101</td>
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</tr>
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<td>102-104</td>
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<td>&quot; Block</td>
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**Address Formats:**

**Address Type 1 - Intersection**

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<th>Description</th>
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<tr>
<td>8-27</td>
<td>A20</td>
<td>On Street Name</td>
</tr>
<tr>
<td>28-31</td>
<td>A4</td>
<td>&quot; Type</td>
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<tr>
<td>32-51</td>
<td>A20</td>
<td>At Street Name</td>
</tr>
<tr>
<td>52-55</td>
<td>A4</td>
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**Address Type 2 - Street Address**

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<td>A4</td>
<td>House Number Suffix</td>
</tr>
<tr>
<td>18-41</td>
<td>A24</td>
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</tr>
<tr>
<td>42-45</td>
<td>A4</td>
<td>&quot; Type</td>
</tr>
<tr>
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**Address Type 3 - Landmark**

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<tbody>
<tr>
<td>8-55</td>
<td>A48</td>
<td>Landmark Name</td>
</tr>
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*Note: Landmark "OOT" is used for addresses outside the Atlanta Area. When geocoded, this landmark is associated with 1st tract 99999 and 1st block 999*

**Address Type 4 - MARTA Station**

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INCOME

WEEKDAY Rail Responses

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Missing cases 22644

SATURDAY Rail Responses

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Missing cases 11866

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1-42
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Total 47343
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Missing cases 74
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RAIL STATION OF ENTRY

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Total 198606 100.0 100.0

Valid cases 198606 Missing cases 0


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Total: 100671

Valid cases: 100671
Missing cases: 0

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**RAIL STATION ON EXIT**

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Valid cases 198606  Missing cases 0

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### RAIL STATION ON EXIT

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Valid cases 100671 Missing cases 0
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RAIL STATION ON EXIT

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1-49
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<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>WALK-BIKE</td>
<td>36094</td>
<td>76.2</td>
<td>76.9</td>
<td>76.9</td>
</tr>
<tr>
<td>AUTO PASSNGR-PARKED</td>
<td>1252</td>
<td>2.6</td>
<td>2.7</td>
<td>79.6</td>
</tr>
<tr>
<td>DRIVE</td>
<td>4795</td>
<td>10.1</td>
<td>10.2</td>
<td>89.8</td>
</tr>
<tr>
<td>TAXI</td>
<td>559</td>
<td>1.2</td>
<td>1.2</td>
<td>91.0</td>
</tr>
<tr>
<td>PICKED UP</td>
<td>4243</td>
<td>9.0</td>
<td>9.0</td>
<td>100.0</td>
</tr>
<tr>
<td>.</td>
<td>400</td>
<td>.8</td>
<td>Missing</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>47343</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td></td>
</tr>
</tbody>
</table>

Valid cases 46943

Missing cases 400

1-50
## Exhibit 1-25

### Rail Trips and Average Trip Length by Income Group

#### Weekday

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Trips</th>
<th>Average Length (miles)</th>
<th>Standard Error or the Mean</th>
<th>95% CI Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $5,000</td>
<td>17223</td>
<td>5.67</td>
<td>.1948</td>
<td>6.73%</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>12709</td>
<td>6.07</td>
<td>.2087</td>
<td>6.74%</td>
</tr>
<tr>
<td>$10,000 - $14,999</td>
<td>20169</td>
<td>6.78</td>
<td>.1818</td>
<td>5.26%</td>
</tr>
<tr>
<td>$15,000 - $24,999</td>
<td>37436</td>
<td>6.86</td>
<td>.1299</td>
<td>3.71%</td>
</tr>
<tr>
<td>$25,000 - $34,999</td>
<td>31604</td>
<td>7.47</td>
<td>.1318</td>
<td>3.46%</td>
</tr>
<tr>
<td>$35,000 or more</td>
<td>56820</td>
<td>7.90</td>
<td>.0987</td>
<td>2.45%</td>
</tr>
<tr>
<td>Unknown</td>
<td>22644</td>
<td>6.78</td>
<td>.1699</td>
<td>4.91%</td>
</tr>
<tr>
<td><strong>All Rail Trips</strong></td>
<td><strong>198606</strong></td>
<td><strong>7.08</strong></td>
<td><strong>.0548</strong></td>
<td><strong>1.52%</strong></td>
</tr>
</tbody>
</table>

#### Saturday

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Trips</th>
<th>Average Length (miles)</th>
<th>Standard Error of the Mean</th>
<th>95% CI Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $5,000</td>
<td>5086</td>
<td>6.15</td>
<td>.4669</td>
<td>14.88%</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>10210</td>
<td>5.11</td>
<td>.4785</td>
<td>18.35%</td>
</tr>
<tr>
<td>$10,000 - $14,999</td>
<td>8643</td>
<td>6.15</td>
<td>.4269</td>
<td>13.61%</td>
</tr>
<tr>
<td>$15,000 - $24,999</td>
<td>16380</td>
<td>6.53</td>
<td>.3020</td>
<td>9.06%</td>
</tr>
<tr>
<td>$25,000 - $34,999</td>
<td>18184</td>
<td>6.81</td>
<td>.3667</td>
<td>10.55%</td>
</tr>
<tr>
<td>$35,000 or more</td>
<td>30302</td>
<td>7.93</td>
<td>.2315</td>
<td>5.72%</td>
</tr>
<tr>
<td>Unknown</td>
<td>11866</td>
<td>6.59</td>
<td>.3691</td>
<td>10.98%</td>
</tr>
<tr>
<td><strong>All Rail Trips</strong></td>
<td><strong>100671</strong></td>
<td><strong>6.81</strong></td>
<td><strong>.1311</strong></td>
<td><strong>3.78%</strong></td>
</tr>
</tbody>
</table>

#### Sunday

<table>
<thead>
<tr>
<th>Income Group</th>
<th>Trips</th>
<th>Average Length (miles)</th>
<th>Standard Error of the Mean</th>
<th>95% CI Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $5,000</td>
<td>3699</td>
<td>6.90</td>
<td>.4702</td>
<td>13.36%</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>3569</td>
<td>6.36</td>
<td>.4400</td>
<td>13.56%</td>
</tr>
<tr>
<td>$10,000 - $14,999</td>
<td>6852</td>
<td>6.09</td>
<td>.4443</td>
<td>14.30%</td>
</tr>
<tr>
<td>$15,000 - $24,999</td>
<td>6833</td>
<td>7.01</td>
<td>.4108</td>
<td>11.49%</td>
</tr>
<tr>
<td>$25,000 - $34,999</td>
<td>6756</td>
<td>6.98</td>
<td>.4357</td>
<td>12.23%</td>
</tr>
<tr>
<td>$35,000 or more</td>
<td>13851</td>
<td>9.34</td>
<td>.2879</td>
<td>6.04%</td>
</tr>
<tr>
<td>Unknown</td>
<td>5782</td>
<td>6.93</td>
<td>.4473</td>
<td>12.65%</td>
</tr>
<tr>
<td><strong>All Rail Trips</strong></td>
<td><strong>47343</strong></td>
<td><strong>7.49</strong></td>
<td><strong>.1561</strong></td>
<td><strong>4.08%</strong></td>
</tr>
</tbody>
</table>
## EXHIBIT 1-26
RAIL TRIPS BY LINE AND INCOME GROUP

### WEEKDAY

<table>
<thead>
<tr>
<th>Income Group</th>
<th>North</th>
<th>South</th>
<th>East</th>
<th>West</th>
<th>All Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $5,000</td>
<td>6791</td>
<td>6265</td>
<td>4251</td>
<td>4136</td>
<td>21442</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>5400</td>
<td>4083</td>
<td>2742</td>
<td>3278</td>
<td>15502</td>
</tr>
<tr>
<td>$10,000 - $14,999</td>
<td>7893</td>
<td>5674</td>
<td>5659</td>
<td>5774</td>
<td>24999</td>
</tr>
<tr>
<td>$15,000 - $24,999</td>
<td>18806</td>
<td>10984</td>
<td>9274</td>
<td>8829</td>
<td>47893</td>
</tr>
<tr>
<td>$25,000 - $34,999</td>
<td>15558</td>
<td>9725</td>
<td>9797</td>
<td>5202</td>
<td>40283</td>
</tr>
<tr>
<td>$35,000 or more</td>
<td>32798</td>
<td>16381</td>
<td>16608</td>
<td>6830</td>
<td>72617</td>
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<tr>
<td>Unknown</td>
<td>9597</td>
<td>7432</td>
<td>5631</td>
<td>6697</td>
<td>29357</td>
</tr>
<tr>
<td><strong>All Income Groups</strong></td>
<td>96843</td>
<td>60544</td>
<td>53961</td>
<td>40746</td>
<td>252094</td>
</tr>
</tbody>
</table>

### SATURDAY

<table>
<thead>
<tr>
<th>Income Group</th>
<th>North</th>
<th>South</th>
<th>East</th>
<th>West</th>
<th>All Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $5,000</td>
<td>1916</td>
<td>1357</td>
<td>1111</td>
<td>1719</td>
<td>6103</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>3990</td>
<td>2409</td>
<td>2376</td>
<td>4357</td>
<td>13132</td>
</tr>
<tr>
<td>$10,000 - $14,999</td>
<td>3006</td>
<td>3562</td>
<td>2639</td>
<td>1179</td>
<td>10386</td>
</tr>
<tr>
<td>$15,000 - $24,999</td>
<td>7336</td>
<td>6393</td>
<td>3574</td>
<td>3534</td>
<td>20837</td>
</tr>
<tr>
<td>$25,000 - $34,999</td>
<td>11430</td>
<td>2839</td>
<td>7228</td>
<td>2257</td>
<td>23755</td>
</tr>
<tr>
<td>$35,000 or more</td>
<td>19094</td>
<td>6716</td>
<td>8316</td>
<td>5624</td>
<td>39749</td>
</tr>
<tr>
<td>Unknown</td>
<td>5042</td>
<td>4046</td>
<td>1966</td>
<td>3636</td>
<td>14689</td>
</tr>
<tr>
<td><strong>All Income Groups</strong></td>
<td>51814</td>
<td>27322</td>
<td>27208</td>
<td>22307</td>
<td>128651</td>
</tr>
</tbody>
</table>

### SUNDAY

<table>
<thead>
<tr>
<th>Income Group</th>
<th>North</th>
<th>South</th>
<th>East</th>
<th>West</th>
<th>All Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $5,000</td>
<td>1476</td>
<td>1449</td>
<td>808</td>
<td>1041</td>
<td>4775</td>
</tr>
<tr>
<td>$5,000 - $9,999</td>
<td>1751</td>
<td>683</td>
<td>412</td>
<td>1729</td>
<td>4574</td>
</tr>
<tr>
<td>$10,000 - $14,999</td>
<td>2132</td>
<td>3225</td>
<td>1079</td>
<td>1831</td>
<td>8268</td>
</tr>
<tr>
<td>$15,000 - $24,999</td>
<td>3138</td>
<td>2548</td>
<td>1595</td>
<td>1240</td>
<td>8521</td>
</tr>
<tr>
<td>$25,000 - $34,999</td>
<td>2905</td>
<td>2841</td>
<td>1113</td>
<td>1418</td>
<td>8277</td>
</tr>
<tr>
<td>$35,000 or more</td>
<td>7218</td>
<td>4547</td>
<td>2652</td>
<td>2332</td>
<td>16749</td>
</tr>
<tr>
<td>Unknown</td>
<td>2267</td>
<td>2161</td>
<td>707</td>
<td>1531</td>
<td>6666</td>
</tr>
<tr>
<td><strong>All Income Groups</strong></td>
<td>20887</td>
<td>17455</td>
<td>8366</td>
<td>11120</td>
<td>57829</td>
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</table>

*Note: Transferring Passengers are Counted Twice.*
EXHIBIT 1-27
FARE MEDIA OF INITIAL BUS BOARDINGS AND BUS TRANSFERS

WEEKDAY

<table>
<thead>
<tr>
<th>Fare Media</th>
<th>Initial Boardings</th>
<th>Bus-Bus Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>13616</td>
<td>919</td>
</tr>
<tr>
<td>Weekly TC</td>
<td>49476</td>
<td>6194</td>
</tr>
<tr>
<td>Monthly TC</td>
<td>13404</td>
<td>2711</td>
</tr>
<tr>
<td>E/H Pass</td>
<td>2617</td>
<td>714</td>
</tr>
<tr>
<td>Cash</td>
<td>50173</td>
<td>5226</td>
</tr>
<tr>
<td>Cobb Xfr</td>
<td>587</td>
<td>513</td>
</tr>
<tr>
<td>Other</td>
<td>940</td>
<td>182</td>
</tr>
<tr>
<td>Unknown</td>
<td>209</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>131019</td>
<td>16459</td>
</tr>
</tbody>
</table>

SATURDAY

<table>
<thead>
<tr>
<th>Fare Media</th>
<th>Initial Boardings</th>
<th>Bus-Bus Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>7627</td>
<td>2945</td>
</tr>
<tr>
<td>Weekly TC</td>
<td>32567</td>
<td>3407</td>
</tr>
<tr>
<td>Monthly TC</td>
<td>4786</td>
<td>281</td>
</tr>
<tr>
<td>E/H Pass</td>
<td>1976</td>
<td>880</td>
</tr>
<tr>
<td>Cash</td>
<td>34617</td>
<td>4895</td>
</tr>
<tr>
<td>Cobb Xfr</td>
<td>719</td>
<td>57</td>
</tr>
<tr>
<td>Other</td>
<td>1275</td>
<td>206</td>
</tr>
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<td>Unknown</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>83567</td>
<td>12672</td>
</tr>
</tbody>
</table>

SUNDAY

<table>
<thead>
<tr>
<th>Fare Media</th>
<th>Initial Boardings</th>
<th>Bus-Bus Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>2286</td>
<td>0</td>
</tr>
<tr>
<td>Weekly TC</td>
<td>9903</td>
<td>1626</td>
</tr>
<tr>
<td>Monthly TC</td>
<td>4918</td>
<td>1852</td>
</tr>
<tr>
<td>E/H Pass</td>
<td>112</td>
<td>0</td>
</tr>
<tr>
<td>Cash</td>
<td>19376</td>
<td>2963</td>
</tr>
<tr>
<td>Cobb Xfr</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>589</td>
<td>0</td>
</tr>
<tr>
<td>Unknown</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>37184</td>
<td>6441</td>
</tr>
</tbody>
</table>
### EXHIBIT 1-28
FARE MEDIA OF INITIAL AND TOTAL RAIL ENTRIES

#### WEEKDAY

<table>
<thead>
<tr>
<th>Fare Media</th>
<th>Initial Entries</th>
<th>Total Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>38446</td>
<td>48079</td>
</tr>
<tr>
<td>Weekly TC</td>
<td>26806</td>
<td>61641</td>
</tr>
<tr>
<td>Monthly TC</td>
<td>16838</td>
<td>24004</td>
</tr>
<tr>
<td>E/H Pass</td>
<td>1460</td>
<td>3024</td>
</tr>
<tr>
<td>Cash</td>
<td>30051</td>
<td>59538</td>
</tr>
<tr>
<td>Cobb Xfr</td>
<td>193</td>
<td>431</td>
</tr>
<tr>
<td>Other</td>
<td>1007</td>
<td>1486</td>
</tr>
<tr>
<td>Unknown</td>
<td>195</td>
<td>404</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>114997</strong></td>
<td><strong>198606</strong></td>
</tr>
</tbody>
</table>

#### SATURDAY

<table>
<thead>
<tr>
<th>Fare Media</th>
<th>Initial Entries</th>
<th>Total Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>20711</td>
<td>24925</td>
</tr>
<tr>
<td>Weekly TC</td>
<td>16744</td>
<td>32225</td>
</tr>
<tr>
<td>Monthly TC</td>
<td>2518</td>
<td>5367</td>
</tr>
<tr>
<td>E/H Pass</td>
<td>614</td>
<td>1001</td>
</tr>
<tr>
<td>Cash</td>
<td>20759</td>
<td>36405</td>
</tr>
<tr>
<td>Cobb Xfr</td>
<td>0</td>
<td>129</td>
</tr>
<tr>
<td>Other</td>
<td>102</td>
<td>618</td>
</tr>
<tr>
<td>Unknown</td>
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<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>61447</strong></td>
<td><strong>100671</strong></td>
</tr>
</tbody>
</table>

#### SUNDAY

<table>
<thead>
<tr>
<th>Fare Media</th>
<th>Initial Entries</th>
<th>Total Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Token</td>
<td>11302</td>
<td>13588</td>
</tr>
<tr>
<td>Weekly TC</td>
<td>5543</td>
<td>10093</td>
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<td>Monthly TC</td>
<td>2350</td>
<td>3828</td>
</tr>
<tr>
<td>E/H Pass</td>
<td>344</td>
<td>456</td>
</tr>
<tr>
<td>Cash</td>
<td>11297</td>
<td>18739</td>
</tr>
<tr>
<td>Cobb Xfr</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>50</td>
<td>639</td>
</tr>
<tr>
<td>Unknown</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30886</strong></td>
<td><strong>47343</strong></td>
</tr>
</tbody>
</table>
### FREE INTERMODAL (FIM) BUS MOVEMENTS

#### WEEKDAY:

<table>
<thead>
<tr>
<th>Movement</th>
<th>Volume</th>
<th>% of Gross</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outbound to Bus</td>
<td>76</td>
<td>0.12%</td>
</tr>
<tr>
<td>Outbound to Area</td>
<td>5626</td>
<td>8.91%</td>
</tr>
<tr>
<td>Ride-thrus</td>
<td>3257</td>
<td>5.16%</td>
</tr>
<tr>
<td>To FIM Bus</td>
<td>4597</td>
<td>7.28%</td>
</tr>
<tr>
<td>To Rail</td>
<td>49563</td>
<td>78.52%</td>
</tr>
</tbody>
</table>

**Gross FIM Bus Arrivals**: 63119

#### SATURDAY:

<table>
<thead>
<tr>
<th>Movement</th>
<th>Volume</th>
<th>% of Gross</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outbound to Bus</td>
<td>303</td>
<td>1.16%</td>
</tr>
<tr>
<td>Outbound to Area</td>
<td>2228</td>
<td>8.51%</td>
</tr>
<tr>
<td>Ride-thrus</td>
<td>590</td>
<td>2.25%</td>
</tr>
<tr>
<td>To FIM Bus</td>
<td>5741</td>
<td>21.92%</td>
</tr>
<tr>
<td>To Rail</td>
<td>17324</td>
<td>66.16%</td>
</tr>
</tbody>
</table>

**Gross FIM Bus Arrivals**: 26186

#### SUNDAY:

<table>
<thead>
<tr>
<th>Movement</th>
<th>Volume</th>
<th>% of Gross</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outbound to Bus</td>
<td>0</td>
<td>0.00%</td>
</tr>
<tr>
<td>Outbound to Area</td>
<td>226</td>
<td>1.69%</td>
</tr>
<tr>
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**Gross FIM Bus Arrivals**: 9504

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**Gross FIM Bus Departures**: 61695

**Gross FIM Bus Departures**: 36853

**Gross FIM Bus Departures**: 14852

---

1-55
## EXHIBIT 1-30
TRANSFER ANALYSIS - WEEKDAY

### AT FREE-INTERMODAL (FIM) RAIL STATIONS

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**EXHIBIT 1-30**

**TRANSFER ANALYSIS - SATURDAY**

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## AT OTHER PLACES

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## AT ALL PLACES

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SECTION 2
MODE OF ARRIVAL SURVEY

This section of the report contains information on the sample design and survey procedures used, as well as procedures for data management and analysis for the mode of arrival survey. Analysis of the survey results is also presented, along with an accuracy analysis of the results. This analysis is presented for the worst case proportion (.5) at the 90% confidence interval. The Research Objective indicated that accuracy of ±10 at the 90% confidence interval was desired. The accuracy achieved was better than required by the Research Objective.

Section 2.1 provides an overview of the procedures employed in conducting the mode of arrival survey, including the sampling plan. Section 2.2 details the data collection procedures, data analysis, weighting and validation of survey results. Section 2.3 presents a summary of the results and discusses the reliability of these results. Appendix A presents a discussion of the precision or accuracy of the survey proportions.

2.1 SURVEY DESIGN AND PREPARATION

The survey design phase of the project established the basic framework and parameters for conducting the other, subsequent survey-specific tasks. A technical memorandum describing refinements to the original study design contained in GH&A's technical proposal was submitted to MARTA in early October 1989.

GH&A conducted a special enumeration of passengers entering rail stations, to provide a basis for estimating mode of arrival by time of day. The objective of this survey was to provide a reliable estimate of the proportion of patrons arriving by all available modes by time period.
2.1.1 Sampling Plan

The design accuracy for mode of arrival proportions was ±10% reliability at the 90% confidence interval. Statistically, this objective could be satisfied by 68 responses. In order to provide representative estimates it was necessary to gather these responses on several different days.

Our sampling plan for this survey called for samples to be collected at each rail station/time period on four separate days (two weekdays, one Saturday and one Sunday). On weekdays, four time periods were defined (AM peak, midday, PM peak, and other). On weekends, two time periods were defined (daytime and other). Execution of this plan required surveying each rail station for eight separate weekday hours, two Saturday hours, and two Sunday hours. At free intermodal stations, two parallel surveys were required, one based on mode of arrival through the fare gates and one based on free intermodal bus arrivals.

2.1.2 Procedures Development

The mode of arrival survey required development of well documented procedures for data collection and control. Procedures developed included specialized training, sample selection, and data editing and error resolution.

2.1.2.1 Surveyor Training

Due to the nature of the mode of arrival survey, a special classroom training sessions was required for personnel who were going to administer the survey. Individuals were trained in how to properly "choose" the respondents so as to not introduce bias in the selection process and how to collect the demographic data.

2.1.2.2 Sample Selection

For weekdays, two separate samples were planned for each station/time period. In order to obtain a representative distribution, one sample was designated early and the
other late. Then samples were selected for scheduling randomly with the stipulation that no early and late time period sample for a station be scheduled for the same day. After the initial schedule was drawn, revisions were made to effect a reasonable geographic distribution of samples by time period and day.

The weekend sample was drawn in a similar fashion. However, instead of designating samples as early and late, station/time period samples were designated for Saturday and Sunday. As with the weekday sample, the initial, random schedule was revised to improve the geographic distribution of data collection.

2.1.2.3 Survey Instrument and Control Log Design

The mode of arrival survey objectives were considerably less complex than those for the on-board surveys. This survey was designed as a brief personal interview to determine how passengers entering through fare gates arrived at the station. The interview form used to capture this information is shown in Exhibit 2-1. There was no pre-testing of this form, due to the limited nature of the questions. Passengers arriving by bus at free intermodal stations were determined by direct enumeration, therefore no survey instrument was required.

Response bias control information for the mode of arrival survey and the on-board rail survey was gathered as part of the mode of arrival survey. Surveyors were required to record the gender and race of each patron approached for interview (including those that refused to participate). This provided an accurate profile of these attributes by station and time period.

Two control logs were designed for the mode of arrival survey. The first of these, the Faregate Reading Control Log, was used by surveyors to record gate readings both before and after the survey period. The second control log, the Bus Load Count Control Log, was used to record inbound bus load information at free intermodal stations.
EXHIBIT 2-2

MODE OF ARRIVAL SURVEY QUESTIONNAIRE

Location Name ________________________________

Survey Date ______________________ 1989

Start Time ________ : ________ AM PM

Stop Time ________ : ________ AM PM

BE COURTEOUS. THANK EACH PERSON YOU SPEAK TO EVEN IF THEY REFUSE TO RESPOND.

1. How did you get here (to this station) today? ______ Refused (go to 3.)
   (11) Walked
   (12) Rode a bike
   (14) Rode a bus
   (15) Rode in a taxi
   (16) Drove or rode in a car parked here. How many people including yourself rode in the car? ______

2. Are you going to a train or a bus? ______
   (11) Train
   (12) Bus

3. By observation the respondent is ______ Male ______ Female
   (11) Black ______ White ______ Asian ______ Other

1. How did you get here (to this station) today? ______ Refused (go to 3.)
   (11) Walked
   (12) Rode a bike
   (14) Rode a bus
   (15) Rode in a taxi
   (16) Drove or rode in a car parked here. How many people including yourself rode in the car? ______

2. Are you going to a train or a bus? ______
   (11) Train
   (12) Bus

3. By observation the respondent is ______ Male ______ Female
   (11) Black ______ White ______ Asian ______ Other

1. How did you get here (to this station) today? ______ Refused (go to 3.)
   (11) Walked
   (12) Rode a bike
   (14) Rode a bus
   (15) Rode in a taxi
   (16) Drove or rode in a car parked here. How many people including yourself rode in the car? ______

2. Are you going to a train or a bus? ______
   (11) Train
   (12) Bus

3. By observation the respondent is ______ Male ______ Female
   (11) Black ______ White ______ Asian ______ Other

2-4
2.1.3 Survey Preparation

Because the mode of arrival survey was conducted in conjunction with the on-board surveys, all necessary equipment, supplies, personnel and training needed to complete the data collection and analysis phases of the project were completed simultaneously.

2.2 DATA COLLECTION AND ANALYSIS

GH&A staff arrived in Atlanta on October 8, 1989 to set up the field office to manage the data collection phase for both the mode of arrival and on-board surveys. Actual field work for the mode of arrival survey occurred between the months of October through December, 1989.

2.2.1 Data Collection Activities

The data collection efforts for the mode of arrival survey were different from the on-board surveys. As previously mentioned, these were personal interviews, conducted inside the rail stations. Surveyors were also required to enumerate candidate respondents (including refusals) by gender and race, and take fare gate readings at scheduled times. A copy of the fare gate reading log is shown in Exhibit 2-2.

Observers at free intermodal bus platforms were required to record the passengers aboard each inbound bus and record route and time information. The control log used for this aspect of the mode of arrival survey is shown in Exhibit 2-3.

2.2.2 Data Editing

As mode of arrival surveys were completed, they were reviewed to ensure that the work was successfully performed. Following that, all data from the completed control logs and questionnaires were immediately keyed into the appropriate control logs data base.
### EXHIBIT 2-2
MODE OF ARRIVAL FAREGATE READINGS CONTROL LOG

**MARTA Fall 1989 Rail Station Survey**  
Station Faregate Readings  
Sample 10521, Survey for 30 minutes  

**Assignment MA090, Page 5**  
Arts Center - West Peachtree  
Weekday Date: 1/28/89  
During Period: 6:30 am to 8:00 am  

<table>
<thead>
<tr>
<th>Surveyors:</th>
<th>Weather:</th>
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#### FAREGATE READINGS BEFORE SURVEY

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<th>#3</th>
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<th>#5</th>
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#### FAREGATE READINGS AFTER SURVEY

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# EXHIBIT 2-3

**MODE OF ARRIVAL BUS LOAD COUNT CONTROL LOG**

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**Assignment LA090, Page 3**

**Arts Center**

**Weekday Date:** 8/89

**During Period:** 6:30 am to 8:00 am

**Surveyors:**

**Weather:**

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2-7
2.2.3 Sample Weighting and Validation

All weighting of mode of arrival survey data was performed at the stratum level (day type, station and time period). Weighting within time period was accomplished by normalizing each count by type (fare gate and bus load if appropriate) to a full hour and then averaging the observations.

Response bias adjustments were based on data enumerated during the survey. These were applied by day type, station and time period.

No independent comprehensive data on mode of arrival were available for validation. Final estimates were provided to MARTA Service Planning and Monitoring staff for review. The estimates were found to be reasonable.

2.3 SUMMARY OF RESULTS

Research Objective 6 dealt with the mode of arrival survey. Specifically, data was to be collected to determine mode of access proportions by station and time period. Unlike the on-board surveys, the mode of arrival survey was conducted using two day types, weekday and weekend. Also, there were four time periods on the weekday and two time periods on the weekend.

2.3.1 Mode of Access at Rail Stations

Exhibit 2-4 describes mode of access proportions. Mode of arrival patterns follow traditional observations. Auto and bus are the primary modes of arrival at suburban rail stations, and walking is the primary mode of arrival at downtown rail stations.

The accuracy analysis for this survey is shown below. It is based on the worst case proportion (.5) at the 90% confidence interval, and is the average of all stations by day type and time period. Similar statistics by station are shown in Appendix A, which also contains a discussion of the computation of the accuracy of survey proportions.
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STATION MODE OF ARRIVAL PROPORTIONS – WEEKDAY Page 2

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SECTION 3
SPECIAL ATTITUDINAL SURVEY

This section of the report contains information on the sample design, survey procedures and analysis of the survey results from the service quality/cost attitude survey. Section 3.1 provides an overview of the procedures employed in conducting the attitudinal survey, including the sampling plan. Section 3.2 details the data collection procedures, data analysis, weighting and validation of survey results. Section 3.3 presents a summary of the results and discusses the reliability of these results. The accuracy analysis is based on the worst case proportion (.5) at the 95% confidence interval.

3.1 SURVEY DESIGN AND PREPARATION

A special attitudinal survey was conducted over a one week period to gather data on the riderships' attitudes regarding service quality and cost. The objective of this survey was to provide data to MARTA policy makers as they deliberated tariff and schedule changes.

3.1.1 Sampling Plan

The special attitude survey also required a separate sampling plan. Data were collected via personal interviews on trains and representative bus platforms over a four day time frame. The rail sample was designed at 1,152 responses (±2.9% reliability at the 95% confidence interval) and the bus sample at 288 responses (±5.8% reliability at the 95% confidence interval). Overall, this would result in a ±2.6% reliability at the 95% confidence interval. The sample sizes were based on the assumption that the train surveyors were able to collect 12 responses per hour and platform surveyors were able to collect 6 responses per hour.

3.1.2 Procedures Development

The administration of the attitudinal survey was similar to that used in the mode
of arrival survey. Therefore, the procedures used to implement and analyze the data were similar.

3.1.2.1 Surveyor Training

Due to the nature of the service quality/cost survey, a special classroom training sessions was required for personnel who were going to administer the survey. Individuals were trained in how to properly "choose" the respondents so as to not introduce bias in the selection process and how to collect the necessary demographic data.

3.1.2.2 Sample Selection

Sampling for the service cost/quality attitude survey was accomplished by stationing surveyors on-board representative trains and at representative bus platforms. Trains were selected to provide complete coverage of the system. Bus platforms were selected to provide the maximum opportunity for locating bus-only passengers, and included platforms on all rail lines and at Five Points. In all, six bus platforms were included in the survey. On-board and platform interviews were scheduled from 6 AM to 9 PM on three weekdays and one Saturday.

3.1.2.3 Survey Instrument Design

Examples of the survey instruments used for the special attitudinal study are shown in Exhibits 3-1 and 3-2. The basic form was successfully used by MARTA research staff previously and was not pretested for this study. Response bias control was handled in the same fashion as for the mode of arrival survey.

3.1.3 Survey Preparation

GH&A recruited surveyor personnel from the pool of surveyors who worked on the on-board and mode of arrival surveys. Questionnaires were printed by GH&A and supplies from the on-board survey were used for this survey.
EXHIBIT 3-1
SPECIAL ATTITUDINAL SURVEY FORM - BUS

Time: _____ AM/PM
Platform: 

HELLO, I'M TAKING A SHORT SURVEY FOR MARTA. DID YOU ARRIVE HERE ON THE TRAIN?

If the respondent says YES, say THANK YOU and stop here.
Reuse this page for the next respondent.

By observation, the respondent is:

[ ] Male  [ ] Female  [ ] Asian  [ ] Other
[ ] Black  [ ] White  [ ] Other

I'D LIKE YOUR OPINION ON SOME IMPORTANT TOPICS.

If the respondent refuses to answer check here [ ] and say THANK YOU.
Use a new page for the next respondent.

- HOW LONG HAVE YOU BEEN USING MARTA?
  [ ] 1 Under 1 month  [ ] 2 1 - 6 months  [ ] 3 7 - 12 months  [ ] 4 Over 12 months

- HOW MANY DAYS A WEEK DO YOU USUALLY RIDE MARTA?
  [ ] 1 One  [ ] 3 Three  [ ] 5 Five  [ ] 7 Seven
  [ ] 2 Two  [ ] 4 Four  [ ] 6 Six

- WHERE ARE YOU GOING NOW? (If the answer is HOME ask WHERE ARE YOU COMING FROM?)
  [ ] 1 Work  [ ] 2 School  [ ] 3 Shopping  [ ] 4 Other

- WHAT KIND OF TRIP DO YOU MAKE MOST OFTEN ON MARTA?
  [ ] 1 Work  [ ] 2 School  [ ] 3 Shopping  [ ] 4 Other

- PLEASE RATE MARTA ON THE FOLLOWING:
  Security  [ ] 1 Very Good  [ ] 2 Good  [ ] 3 OK  [ ] 4 Poor  [ ] 5 Very Poor
  Cost of Service  [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5
  Cleanliness  [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5
  Time Between Buses  [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

- IF YOU HAD TO WAIT A FEW MINUTES MORE FOR A BUS, WOULD YOU USE IT LESS OFTEN?
  [ ] 1 No
  If YES, Would you: [ ] 2 Stop riding  [ ] 3 Ride much less often  [ ] 4 Ride a little less often

- HOW DO YOU NORMALLY PAY TO RIDE MARTA? (Check only one)
  [ ] 1 Cash/Token  [ ] 3 Weekly Transcard
  [ ] 2 Senior or Handicapped Pass  [ ] 4 Monthly Transcard

- If the response is Cash/Token: say, BASED ON 85 CENTS
  S/H Pass: 40 CENTS
  Weekly TC: 8 DOLLARS
  Monthly TC: 32 DOLLARS

HOW MUCH MORE WOULD YOU PAY FOR MARTA SERVICE WITHOUT CHANGING HOW OFTEN YOU RIDE? $_____

- THANK YOU FOR YOUR HELP
EXHIBIT 3-2
SPECIAL ATTITUDBINAL SURVEY FORM - RAIL

Time ___ AM/PM    Boarding Station:

By observation, the respondent is:
[ ] 1 Male    [ ] 2 Female
[ ] 3 Black    [ ] 4 White    [ ] 5 Asian    [ ] 6 Other

HELLO, I'M TAKING A SHORT SURVEY FOR MARTA AND WOULD LIKE YOUR OPINION ON SOME IMPORTANT TOPICS.

If the respondent refuses to answer check here [ ] and say THANK YOU.
Use a new page for the next respondent.

► HOW LONG HAVE YOU BEEN USING MARTA?
[ ] 1 Under 1 month    [ ] 2 1 - 6 months    [ ] 3 7 - 12 months    [ ] 4 Over 12 months

► HOW MANY DAYS A WEEK DO YOU USUALLY RIDE MARTA?
[ ] 1 One    [ ] 2 Two    [ ] 3 Three    [ ] 4 Four    [ ] 5 Five    [ ] 6 Six
[ ] 7 Seven

► WHERE ARE YOU GOING NOW? (If the answer is HOME ask WHERE ARE YOU COMING FROM?)
[ ] 1 Work    [ ] 2 School    [ ] 3 Shopping    [ ] 4 Other

► WHAT KIND OF TRIP DO YOU MAKE MOST OFTEN ON MARTA?
[ ] 1 Work    [ ] 2 School    [ ] 3 Shopping    [ ] 4 Other

► DO YOU ALSO RIDE MARTA BUSES?
[ ] 1 No    [ ] 2 Yes

► PLEASE RATE MARTA ON THE FOLLOWING:
Very
Security    [ ] 1 Good    [ ] 2 Good    [ ] 3 OK    [ ] 4 Poor    [ ] 5 Very Poor
Cost of Service
Cleanliness
Time Between Trains

If the respondent also rides the bus ask:
Time Between Buses

► IF YOU HAD TO WAIT A FEW MINUTES MORE FOR A TRAIN, WOULD YOU RIDE LESS OFTEN?
[ ] 1 No
If YES, Would you: [ ] 2 Stop riding    [ ] 3 Ride much less often    [ ] 4 Ride a little less often

If the respondent also rides the bus ask:
► IF YOU HAD TO WAIT A FEW MINUTES MORE FOR A BUS, WOULD YOU USE IT LESS OFTEN?
[ ] 1 No
If YES, Would you: [ ] 2 Stop riding    [ ] 3 Ride much less often    [ ] 4 Ride a little less often

► HOW DO YOU NORMALLY PAY TO RIDE MARTA? (Check only one)
[ ] 1 Cash/Token    [ ] 2 Senior or Handicapped Pass    [ ] 3 Weekly Transcard
[ ] 4 Monthly Transcard

► If the response is
Cash/Token: say, BASED ON
S/H Pass: 85 CENTS
Weekly TC: 40 CENTS
Monthly TC: 8 DOLLARS

HOW MUCH MORE WOULD YOU PAY FOR MARTA SERVICE WITHOUT CHANGING HOW OFTEN YOU RIDE? $__

► THANK YOU FOR YOUR HELP

3-4
3.2 DATA COLLECTION AND ANALYSIS

The attitudinal survey was conducted over a four day period at the end of January 1990. GH&A staff arrived in Atlanta a few days early to hire and train staff.

3.2.1 Data Collection Activities

Like the mode of arrival survey, the special attitudinal survey was also a personal interview. Surveyors enumerated all candidate respondents (including refusals) by gender and race. No control logs were necessary for this survey.

3.2.2 Data Editing

All data for the survey were edited and machine entered at the end of the survey period. All the data were 100% key verified.

3.2.3 Sample Weighting and Validation

Once all data inconsistencies were resolved, sample data were weighted to represent all target MARTA patrons. The method used to weight the survey is described below.

This survey was designed to produce only system-wide estimates of attitudes. Therefore, only response bias adjustments were performed. These were based on data enumerated during the survey and applied to the aggregate survey results.

No independent comprehensive data on service quality/cost attitudes were available for validation.

3.3 SURVEY RESULTS

Data for Exhibit 3-3 came from the service quality/cost attitude survey. Many other tabulations of the attitudinal survey data providing more detailed, cross sectional analysis were delivered to MARTA research staff separately.
Survey respondents were asked how much more they would pay for MARTA service and still continue to use MARTA with the same amount of frequency (tolerable fare increase). The data in Exhibit 3-3 shows the results of this analysis by fare type and by bus only, rail only and bus & rail riders. On the average, bus only riders indicated they would tolerate an 8.59% increase in fare. Patrons using a senior-handicapped card responded they would tolerate a 12.50% increase, cash and token riders indicated a 10% increase was acceptable, while monthly transcard users indicated an average of 5% increase.

Rail only riders indicated they would tolerate a higher average fare increase and still maintain their current level of usage. The average fare increase for all fare types is 14.64%. Whereas cash and token riders indicated a 15% increase was acceptable, the average percent increase for monthly transcard users was 8.61%.

These basic observations remain constant for the respondents who rode both the bus and the rail. The average acceptable fare increase for this group of riders is 10.68%, slightly higher than bus only riders, but lower than rail only riders.
EXHIBIT 3-3
RESULTS OF THE ATTITUDINAL SURVEY

TOLERABLE FARE INCREASE FOR BUS ONLY RIDERS

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<th>Payment Method</th>
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<th>Standard Error of the Mean</th>
<th>95% CI Accuracy</th>
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TOLERABLE FARE INCREASE FOR RAIL ONLY RIDERS

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<th>Standard Error of the Mean</th>
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<td>Monthly transCard</td>
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<td>1.16</td>
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<td>286</td>
<td>14.64</td>
<td>.85</td>
<td>1.67%</td>
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TOLERABLE FARE INCREASE FOR BUS & RAIL RIDERS

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<th>95% CI Accuracy</th>
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<td>.95</td>
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<td>810</td>
<td>10.68</td>
<td>.56</td>
<td>1.10%</td>
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APPENDIX A

ACCURACY OF SURVEY ESTIMATED PROPORTIONS
Generally, the accuracy (precision) values cited in the main sections of this report are based on the worst case; a proportion of .5 (50 percent). The precision of smaller and larger proportions will always be less (better) than this value. This appendix provides a more detailed discussion of precision.

Precision of estimated proportions is computed using the following formula.

\[ e = 100 \times Z \times \sqrt{\frac{N - n}{N - 1}} \times \sqrt{\frac{pq}{n}} \]  

(1)

where:

- \( e \) is the precision of the proportion stated as a percent,
- \( Z \) is the value of the normal deviate for the desired confidence interval (\( Z = 1.96 \) for 95 percent confidence and 1.65 for 90 percent confidence),
- \( N \) is the estimated total population of the analysis frame,
- \( n \) is the sampled population from the analysis frame,
- \( p \) is the estimated proportion, and
- \( q \) is 1-\( p \).

The following sections demonstrate the application of this formula and provide a detailed discussion of precision, by survey.

A.1 On-board Survey

Exhibit A-1 shows the 95 percent confidence interval precision for each analysis frame (day type/mode) of the On-board Survey for proportions ranging from 0.1 (10%) to 0.9 (90%). The following example describes how this exhibit may be used.

Exhibit 1-5 indicates that 20 percent of the Sunday system patrons pay for their trip on MARTA with a token. This result is based on 1,051 samples from a population of 68,070. Using the Sunday/Use System row and the 0.2 (20 percent) proportion column of Exhibit A-1, indicate that this result has a precision of 2.40 percent.

The confidence range describes the region within which estimates from independent samples will fall. With 95 percent confidence, 95 out of 100 estimates will
be in the range. The upper and lower limits of the confidence range are computed by adding and subtracting the precision from the point estimate. Therefore, our point estimate of 20 percent Sunday/System token users implies the following confidence ranges:

Lower limit = 20.00 - 2.40 = 17.60%
Upper limit = 20.00 + 2.40 = 22.40%

Exhibit A-1 shows precision at .1 (10 percent) intervals for values from .1 to .9. Precision for intermediate values can be determine reasonably accurately from the exhibit by interpolation between values. Precision for very rare or common attribute proportions (less than 0.10 or greater than 0.90) should always be computed using the formula shown in Equation 1. Linear extrapolation from the exhibit for these proportions will not produce correct results.

A.2 Mode of Arrival Survey

Exhibit A-2 provides accuracy information for each analysis frame (day type/station/time period) of the Mode of Arrival survey. The format and usage of this exhibit are similar to Exhibit A-1. Only 90% confidence interval precision is appropriate for this survey.
### EXHIBIT A-1

**PRECISION OF ESTIMATED PROPORTIONS FOR ON-BOARD SURVEY ANALYSIS FRAMES**

<table>
<thead>
<tr>
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<th>Populations:</th>
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## EXHIBIT A-2

**PRECISION OF ESTIMATED PROPORTIONS FOR MODE OF ARRIVAL SURVEY ANALYSIS FRAMES**

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## EXHIBIT A-2

PRECISION OF ESTIMATED PROPORTIONS FOR MODE OF ARRIVAL SURVEY ANALYSIS FRAMES

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## EXHIBIT A-2
PRECISION OF ESTIMATED PROPORTIONS FOR MODE OF ARRIVAL SURVEY ANALYSIS FRAMES

### WEEKDAY - Page 3

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## Weekday - Page 4

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<td>6.36%</td>
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**Precision of Estimated Proportions for Mode of Arrival Survey Analysis Frames**

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**PRECISION OF ESTIMATED PROPORTIONS FOR MODE OF ARRIVAL SURVEY ANALYSIS FRAMES**

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<td>140</td>
<td>155</td>
<td>1.31%</td>
<td>1.74%</td>
<td>1.99%</td>
<td>2.13%</td>
<td>2.18%</td>
<td>2.13%</td>
<td>1.99%</td>
<td>1.74%</td>
<td>1.31%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>81</td>
<td>140</td>
<td>3.58%</td>
<td>4.78%</td>
<td>5.47%</td>
<td>5.85%</td>
<td>5.97%</td>
<td>5.85%</td>
<td>5.47%</td>
<td>4.78%</td>
<td>3.58%</td>
</tr>
<tr>
<td><strong>Decatur</strong></td>
<td>Daytime</td>
<td>122</td>
<td>472</td>
<td>3.86%</td>
<td>5.15%</td>
<td>5.90%</td>
<td>6.31%</td>
<td>6.44%</td>
<td>6.31%</td>
<td>5.90%</td>
<td>5.15%</td>
<td>3.86%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>86</td>
<td>187</td>
<td>3.93%</td>
<td>5.24%</td>
<td>6.01%</td>
<td>6.42%</td>
<td>6.56%</td>
<td>6.42%</td>
<td>6.01%</td>
<td>5.24%</td>
<td>3.93%</td>
</tr>
<tr>
<td><strong>Avondale</strong></td>
<td>Daytime</td>
<td>115</td>
<td>406</td>
<td>3.91%</td>
<td>5.22%</td>
<td>5.98%</td>
<td>6.39%</td>
<td>6.52%</td>
<td>6.39%</td>
<td>5.98%</td>
<td>5.22%</td>
<td>3.91%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>180</td>
<td>427</td>
<td>2.81%</td>
<td>3.75%</td>
<td>4.29%</td>
<td>4.59%</td>
<td>4.68%</td>
<td>4.59%</td>
<td>4.29%</td>
<td>3.75%</td>
<td>2.81%</td>
</tr>
</tbody>
</table>
APPENDIX B

DOCUMENTATION FOR MACHINE READABLE FILES
The on-board surveys collected respondent information using the questionnaire shown in Exhibit 1-1. During computer processing of the resulting data, two separate records were created. One file, the Final Factored Short Response record, contains control, attribute, and weighting information. The other file contains address information.

B.1 FINAL FACTORED SHORT RESPONSE RECORD

A record layout and code definitions for the on-board survey short response file is provided in Exhibit B-1. Generally, the definition of fields is unambiguous and requires no additional explanation. Instructions pertaining to the use of five fields are provided below.

B.1.1 Entry Station and Exit Station

These fields were determined from analysis of the travel pattern of each respondent. These fields identify, by numeric code, the entry and exit stations for respondents using rail. They will be coded 0 for non-rail responses even if the respondent entered or exited rail stations (e.g., to use free intermodal bus service).

B.1.2 Rail Boardings, Bus Boardings and Trip Weight

These factors are all related. The Rail Boarding weight was determined by analysis of the travel pattern and counting the number of trains boarded. Then, this count was multiplied by the trip weight. The Bus Boarding weight was determined in a similar fashion, except only MARTA bus boardings were counted. Any Cobb County buses used in the travel pattern were ignored. The Trip factor (weight) reflects the combined results of both the rail and bus on-board surveys. It is recommended that this factor be used for most analysis. (Section 1 describes how this factor was determined.)

B.2 GEOCODED ADDRESS RECORD

A record layout and code definitions for the on-board survey geocoded address file is provided in Exhibit B-2. Generally, the definition of fields is unambiguous and
requires no additional explanation. Supplementary information for four fields is provided below.

B.2.1 Source Response Serial Number

The source response serial number is the primary field relating address records to response records (the serial number is in columns 27-31 of the short response record). There are at least four (4) records in the address file for each response record.

B.2.2 Source Response Address Number

This field relates an address record to a specific questionnaire address location. The nine possible questionnaire address locations are numbered sequentially from the top as follows:

1* Origin Address
2* 1st Boarding Address
3 2nd Boarding Address
4 3rd Boarding Address
5 4th Boarding Address
6 5th Boarding Address
7* Last Alighting Address
8* Destination Address
9 Home Address

Addresses shown with an asterisk (*) will always be present. In addition, nearly all responses have a home address.

B.2.3 Address Type and Address

The address type indicates the format of the address. The possible type codes and associated address formats are detailed in Exhibit B-2.
## EXHIBIT B-1
FINAL FACTORED SHORT RESPONSE RECORD FORMAT

<table>
<thead>
<tr>
<th>Columns</th>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>I1</td>
<td>Issue Mode (1 = Rail, 2 = Bus)</td>
</tr>
<tr>
<td>2-2</td>
<td>I1</td>
<td>Issue Day (1 = Wkd, 2 = Sat, 3 = Sun)</td>
</tr>
<tr>
<td>3-3</td>
<td>I1</td>
<td>Issue Direction (1 = Inbound, 2 = Outbound)</td>
</tr>
<tr>
<td>4-5</td>
<td>I2</td>
<td>Issue Line (varies by day and mode, see list)</td>
</tr>
<tr>
<td>6-6</td>
<td>I1</td>
<td>Issue Time Period (varies by day, see list)</td>
</tr>
<tr>
<td>7-8</td>
<td>I2</td>
<td>Entry Station (0 or 1-29, see list)</td>
</tr>
<tr>
<td>9-10</td>
<td>I2</td>
<td>Exit Station (0 or 1-29, see list)</td>
</tr>
<tr>
<td>11-13</td>
<td>I3</td>
<td>Survey Assignment</td>
</tr>
<tr>
<td>14-15</td>
<td>I2</td>
<td>Assignment Page</td>
</tr>
<tr>
<td>16-16</td>
<td>I1</td>
<td>Assignment Trip Sequence Number</td>
</tr>
<tr>
<td>17-20</td>
<td>I4</td>
<td>Trip Number</td>
</tr>
<tr>
<td>21-21</td>
<td>I1</td>
<td>Trip Segment Number</td>
</tr>
<tr>
<td>22-22</td>
<td>I1</td>
<td>Segment Serial Range Sequence Number</td>
</tr>
<tr>
<td>23-26</td>
<td>I4</td>
<td>Keyed Trip Number</td>
</tr>
<tr>
<td>27-31</td>
<td>I5</td>
<td>Response Serial Number</td>
</tr>
<tr>
<td>32-32</td>
<td>I1</td>
<td>Origin Purpose</td>
</tr>
<tr>
<td>33-33</td>
<td>I1</td>
<td>How Paid</td>
</tr>
<tr>
<td>34-34</td>
<td>I1</td>
<td>Origin Mode</td>
</tr>
<tr>
<td>35-35</td>
<td>I1</td>
<td>Destination Mode</td>
</tr>
<tr>
<td>36-36</td>
<td>I1</td>
<td>Destination Purpose</td>
</tr>
<tr>
<td>37-37</td>
<td>I1</td>
<td>How Often Ride</td>
</tr>
<tr>
<td>38-39</td>
<td>I2</td>
<td>Household Size</td>
</tr>
<tr>
<td>40-40</td>
<td>I1</td>
<td>Working Vehicles</td>
</tr>
<tr>
<td>41-41</td>
<td>I1</td>
<td>Alternate Way</td>
</tr>
<tr>
<td>42-42</td>
<td>I1</td>
<td>Gender</td>
</tr>
<tr>
<td>43-43</td>
<td>I1</td>
<td>Race</td>
</tr>
<tr>
<td>44-44</td>
<td>I1</td>
<td>Age Group</td>
</tr>
<tr>
<td>45-45</td>
<td>I1</td>
<td>Income Group</td>
</tr>
<tr>
<td>46-46</td>
<td>I1</td>
<td>MARTA Tenure</td>
</tr>
<tr>
<td>47-48</td>
<td>I2</td>
<td>1st Station Mode</td>
</tr>
<tr>
<td>49-49</td>
<td>I1</td>
<td>1st Station Route</td>
</tr>
<tr>
<td>50-52</td>
<td>I3</td>
<td>2nd Station Mode</td>
</tr>
<tr>
<td>53-54</td>
<td>I2</td>
<td>2nd Station Route</td>
</tr>
<tr>
<td>55-55</td>
<td>I1</td>
<td>3rd Station Mode</td>
</tr>
<tr>
<td>56-58</td>
<td>I3</td>
<td>3rd Station Route</td>
</tr>
<tr>
<td>59-60</td>
<td>I2</td>
<td>4th Station Mode</td>
</tr>
<tr>
<td>61-61</td>
<td>I1</td>
<td>4th Station Route</td>
</tr>
<tr>
<td>62-64</td>
<td>I3</td>
<td>5th Station Mode</td>
</tr>
<tr>
<td>65-66</td>
<td>I2</td>
<td>5th Station Route</td>
</tr>
<tr>
<td>67-67</td>
<td>I1</td>
<td>6th Station Mode</td>
</tr>
<tr>
<td>68-70</td>
<td>I3</td>
<td>6th Station Route</td>
</tr>
<tr>
<td>71-72</td>
<td>I2</td>
<td>Rail Boardings (Rail Boardings * Weight)</td>
</tr>
<tr>
<td>73-73</td>
<td>I1</td>
<td>Bus Boardings (Surveyed Bus Boardings * Weight)</td>
</tr>
<tr>
<td>74-76</td>
<td>I3</td>
<td>Trip Weight (Weight)</td>
</tr>
<tr>
<td>77-78</td>
<td>I2</td>
<td>Entry Station to Exit Station Rail Miles</td>
</tr>
</tbody>
</table>

**Note:** Codes are defined on the next page.