# ANALYSIS OF
# ON-BOARD SURVEY
# IN MID-CITIES AREA



JUNE 30, 1976

CENTS
LOS ANGELES, CALIFORNIA

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# SECTION I

## INTRODUCTION

As part of an intensive short-term transit improvement program initiated by SCRTD to evaluate the quality and efficiency of bus service in the Los Angeles Metropolitan Area, CENTS was assigned the task of examining and recommending improvements that could be achieved within available or reasonable resources in The Mid-Cities area. This assignment resulted in a series of recommendations presented to SCRTD in May, 1975. These recommendations were subsequently approved by the Board of Directors of SCRTD and were implemented in March, 1976.

CENTS, as part of their surface planning contract, was given the assignment of evaluating the new service that was to be implemented in the Mid-Cities area. This was to be done in part through two on-board surveys - one conducted prior to the implementation of the new service and one some months after the service had been in operation. Due to the delay in the implementation of the new service, the surveys of the new service were undertaken late in June and time did not permit any analysis to be undertaken. This report presents the results of the survey taken in February, 1976 before the new service was implemented. Recommendations are also included for further analysis that should be undertaken with the on-board "after" surveys to complete the evaluation of the new service.

# SECTION II

# DATA COLLECTION AND PREPARATION

Prior to implementation of the new service, SCRTD operated 15 lines within the area. Table II-1 displays the A.M. peak headway, the number of vehicles required, the percent of operating time within the area, the daily patrons, and other operating statistics for those lines. Also shown are three additional lines that operate only on the periphery of the area but are included due to the fact that the new service effected these lines.

Four types of routes are defined in Table II-1 as follows:

W: Those lines whose stops are totally within the Mid-Cities area.

E: Those lines with one end within the Mid-Cities area and one outside.

T: Those lines with stops in the Mid-Cities area but whose ends are both outside the area.

O: Those lines whose stops are all outside the area.

## DATA COLLECTION

The patrons of interest are those who either get on or off a bus within the Mid-Cities area. The first step in designing the sampling plan was to determine how many patrons are included in this population. The second was to determine how many returns would be required in the sample and the third was to develop the bus runs to be sampled and the number of checkers required. These are discussed in the following sections.

### Daily Patrons Within Area

In order to estimate the daily patronage within the study area, CENTS used the total daily patronage on each route and the percent of operating time spent in the area (see Table II-1). The percent of operating miles within the area was also computed to insure that the figures being used for each line were comparable. The total number of daily patrons within the area was estimated to be 6300 using this method. This compares to 6493 used by CENTS in their May, 1975 final report.

### Sample Size Determination

The determination of sample size was based upon the proposition that information would be required on each specific line. The population

figure used was therefore the total daily ridership on a line whose boarding stop or alighting stop was within the Mid-Cities area. Table II-2 displays the total daily patronage within the area for each line and the sample required for the anaylsis. Appendix A contains the statistical formulation used to arrive at the sample sizes shown in Table II-2.

Schedule of Bus Runs and Checkers Required

The return rate for completed surveys was estimated to be 75-percent of those handed out. This figure was used to determine the actual number of surveys to be given to patrons on each line. Runs were selected based upon the number of expected riders to be found on that run. This number was determined by examining the available riding checks for those lines of interest. The number of checkers required for each line is displayed in Table II-2 and Appendix B presents the specific runs that the checkers were to ride.

The schedule for the checkers includes the stop where they were to get on the bus and the stop where they were to get off the bus. Since there was no interest in riders who boarded and alighted from a bus outside the Mid-Cities area some bus lines were not riden from the beginning to the end. For those lines that were within (W) the area or outside (O) the area, surveys were handed out at all stops along the route. For those lines that end (E) in the area, the checker aboard a bus only rode as far out of the area as needed to enable the collection of surveys from those who boarded within the area. The checker would then cross the street to board the bus selected to be riden that was going in the opposite direction. For those buses traveling into the area, surveys were handed out to all people who boarded the bus. For buses traveling out of the area, surveys were only handed to those persons who boarded the bus within the study area. A similar procedure was used for those lines that go through (T) the study area. The selected last stop was either at the end of the line or at an interim stop outside the Mid-Cities area.

## DATA PREPARATION

The surveys that were returned were subjected to coding, key punching, and computer analysis. Two types of records were produced. The first record consisted of all the entries on the on-board survey except the address in Item #5. The coding sheet and unit record layout for the records are shown in Appendix C. Since the data from the "after" surveys in the Mid-Cities area would not be available for analysis before the expiration of the contract, a decision was made to limit the geographic coding of the bus stops to areas roughly equivalent to the communities making up the Mid-Cities area. The alternative would have been to convert all intersections to geographic coordinates by use of the CENSUS Bureau's ADMATCH program and DIME files. The boundaries for the twelve communities are defined in Table II-3. Included in the geographic coding were certain destinations outside the Mid-Cities area. These codes are listed and described in Table II-3 and in Appendix C.

TABLE II-1

MID-CITIES LINE STATISTICS

| Line | Peak Headway | AM Vehicles | Percent Operating Time in Area | Base Headway | AM Peak Time of Run (Min) | AM Peak Time of Run In Area | Total Average Daily Patrons | Daily Patronage Within Area |
|---|---|---|---|---|---|---|---|---|
| 34 (E) | 20 | 6 | 34 | 60 | 60 | 21 | 1008 | 350 |
| 38 (T) | 240 | 1 | 51 | 240 | 120 | 62 | 91 | 50 |
| 46 (O) | 20 | 8 | 0 | 30 | 80 | 0 | 4159 | 0 |
| 54 (O) | 15 | 12 | 0 | 20 | 90 | 0 | 8356 | 0 |
| 55 (T) | 40 | 3 | 35 | 80 | 60 | 21 | 715 | 250 |
| 58 (T) | 11 | 16 | 17 | 22 | 88 | 15 | 2641 | 450 |
| 72 (T) | 4 | 25 | 31 | 20 | 50 | 16 | 7448 | 2310 |
| 77 (O) | 20 | 5 | 0 | 20 | 50 | 0 | 3333 | 0 |
| 111 (E) | 40 | 4 | 48 | 40 | 80 | 39 | 798 | 390 |
| 112 (E) | 120 | 1 | 44 | 120 | 60 | 27 | 131 | 60 |
| 113 (E) | 60 | 3 | 63 | 60 | 90 | 57 | 597 | 380 |
| 116 (E) | 60 | 2 | 67 | 60 | 60 | 41 | 542 | 370 |
| 117 (W) | 30 | 2 | 100 | 30 | 30 | 30 | 599 | 599 |
| 118 (E) | 120 | 1 | 54 | 120 | 60 | 33 | 180 | 100 |
| 132 (W) | 60 | 4 | 100 | 60 | 120 | 120 | 332 | 332 |
| 134 (E) | 60 | 2 | 15 | 60 | 60 | 9 | 192 | 30 |
| 136 (W) | 60 | 1 | 100 | 60 | 30 | 30 | 140 | 140 |
| 137 (E) | 60 | 3 | 33 | 60 | 90 | 30 | 1162 | 390 |

E: Ends In
T: Through
W: Within
O: Outside

TABLE II-2

MID-CITIES LINE STATISTICS

Sample Required

| Line | Daily Patronage Within Area | Reduced Sample | Checkers Required |
|---|---|---|---|
| 34 (E) | 350 | 78 | 1 |
| 38 (T) | 50 | 34 | 1 |
| 46 (O) | 0 | 416 | 2 |
| 54 (O) | 0 | 836 | 2 |
| 55 (T) | 250 | 72 | 2 |
| 58 (T) | 450 | 82 | 2 |
| 72 (T) | 2310 | 231 | 2 |
| 77 (O) | 0 | 333 | 2 |
| 111 (E) | 390 | 80 | 2 |
| 112 (E) | 60 | 38 | 1 |
| 113 (E) | 380 | 80 | 1 |
| 116 (E) | 370 | 79 | 1 |
| 117 (W) | 599 | 86 | 1 |
| 118 (E) | 100 | 50 | 1 |
| 132 (W) | 332 | 77 | 2 |
| 134 (E) | 30 | 23 | 1 |
| 136 (W) | 140 | 59 | 1 |
| 137 (E) | 390 | 80 | 1 |

E: Ends In
T: Through
W: Within
O: Outside

TABLE II-3

BOUNDARIES OF MID-CITIES COMMUNITIES

| Community | Boundary North | East | West | South |
|---|---|---|---|---|
| PICO RIVERA | Puente Hills | Pioneer Boulevard | Rio Hondo River | Telegraph Avenue |
| WHITTIER | Puente Hills | Orange County | Pioneer River | Telegraph Avenue |
| DOWNEY | Santa Ana Freeway | San Gabriel River | Rio Hondo River | Imperial Highway (S) |
| SANTA FE SPRINGS | Mulberry Drive | Santa Fe Springs Road | San Gabriel River | Florence Avenue |
| NORWALK | Florence Avenue | Valley View Avenue | San Gabriel River | Artesia Boulevard (N) |
| LA MIRADA | Imperial Highway (N) | Orange County | Valley View Avenue | Artesia Boulevard |
| PARAMOUNT | Imperial Highway (S) | Lakewood Boulevard | Los Angeles River | Artesia Boulevard |
| BELLFLOWER | Imperial Highway (S) | San Gabriel River | Lakewood Boulevard | Artesia Boulevard |
| LAKEWOOD | Artesia Boulevard | San Gabriel River | Los Angeles River | Long Beach |
| ARTESIA | Artesia Boulevard | Norwalk Boulevard | San Gabriel River | South Street |
| CERRITOS | South St/Alondre B. | Valley View Avenue | San Gabriel River | Del Amo Boulevard (S) |
| HAWAIIAN GARDENS | Del Amo Boulevard (S) | Long Beach | San Gabriel River | Long Beach |

This broad definition of the geographic boundaries prevents certain analysis from being undertaken. The need for finer resolution would only be helpful if the "after" data were available. For the purposes of the analysis of the "before" data, the subject of this report, the geographic data coded is adequate to determine the existing travel patterns in the Mid-Cities area before the new service went into effect.

The second type of record produced was the address record. Appendix C presents the unit record layout for the address record. These are formatted so that they can be used with the CENSUS Bureau DIME files and ADMATCH program. Of the 1985 surveys returned, 1752 (89-percent) had codeable addresses. These records were only coded and not keypunched since any analysis of these records would only be done in conjunction with the "after" data.

# SECTION III

## ANALYSIS OF RETURNS

A total of 4760 surveys were issued to checkers to be handed out to patrons aboard the buses that were selected for them to ride. The number was based upon previous riding checks the SCRTD conducted on these runs. Only 2170 surveys were handed out to passengers. It would appear that considerably fewer people were riding these specific runs than was estimated from the data. A total of 1985 surveys were returned. Of these, 802 had boarding or alighting stops within the Mid-Cities area with an additional 86 having unknown boarding and alighting stops. A total of 691 surveys were returned from the three lines operating outside the area. Table III-1 summarizes the returns by line. Of the 15 lines operating in the Mid-Cities area, only two have survey returns that represent less than 10 percent of the estimated ridership.

Where averages for the entire Mid-Cities area were required for the analysis, the data has been weighted to take into account the different patronage on each line. Table III-2 presents a comparison between the total patronage by community estimated by CENTS in their May, 1975 final report and the total patronage by community estimated from the survey results. The total patronage estimate differs by less than 2 percent. The distribution by community is different by as much as a factor of 10 for Santa Fe Springs and Lakewood. The difference shown by community is most likely due to the geographic boundaries used to delineate a community. The highly irregular boundaries used by CENTS in May 1975 are the actual legal boundaries of the communities, including the pockets of Los Angeles County scattered throughout the Mid-Cities area. In this recent exercise the boundaries used are those described in Table II-3. These boundaries were designed to basically follow simple geographic lines in order to make the coding easy and to relate community travel to more realistic geographic areas.

### COMPARISON OF LINES BY RIDERSHIP CHARACTERISTICS

Table III-3 presents a distribution, for those lines operating in the Mid-Citites area, of various characteristics of the riders either boarding or alighting within the Mid-Cities area. A weighted average and 95-percent confidence interval for the entire Mid-Cities area has been calculated. Those lines that are statistically different from the Mid-Cities average are denoted by an asterik. The confidence interval for an entry for an individual line can be obtained by examining the number of surveys returned for a specific line indicated in the last column of Table III-1 and Table D-1 in Appendix D which shows the 95-percent confidence interval for various sample sizes and proportions.

TABLE III-1

SUMMARY OF RETURNS

| Route | Number of Surveys Issued to Checkers | Total Number Handed Out | Total (Percent) Returned with Answers * | |
|---|---|---|---|---|
| | | | Total Line | From Within Area |
| 34 | 180 | 67 | 66 (7) | 58 (17) |
| 38 | 70 | 47 | 44 (48) | 30 (60) |
| 46 | 580 | 339 | 326 (8) | 0 - |
| 54 | 850 | 230 | 153 (2) | 0 - |
| 55 | 220 | 170 | 167 (22) | 140 (56) |
| 58 | 400 | 233 | 229 (9) | 106 (24) |
| 72 | 400 | 229 | 221 (3) | 108 (5) |
| 77 | 700 | 226 | 212 (6) | 0 - |
| 111 | 250 | 181 | 171 (21) | 51 (13) |
| 112 | 60 | 31 | 31 (24) | 12 (20) |
| 113 | 130 | 89 | 57 (10) | 53 (14) |
| 116 | 170 | 67 | 55 (10) | 46 (13) |
| 117 | 100 | 62 | 61 (10) | 57 (10) |
| 118 | 100 | 48 | 47 (26) | 27 (27) |
| 132 | 100 | 47 | 44 (13) | 42 (13) |
| 134 | 100 | 20 | 20 (10) | 12 (40) |
| 136 | 100 | 31 | 29 (21) | 28 (20) |
| 137 | 250 | 53 | 52 (4) | 32 (8) |
| | 4670 | 2170 | 1985 | 802 |

* The percentage represents the portion of the ridership of the line, within the area and the total line, that handed in a survey with responses on it.

TABLE III-2

Patronage Estimates

| Community | Estimated Transit Users: Cents Final Report[1] May, 1975 | Estimated Transit Users: Cents On-Board Survey February, 1975 |
|---|---|---|
| Artesia | 53 | 64 |
| Bellflower | 467 | 492 |
| Cerritos | 20 | 8 |
| Downey | 563 | 1190 |
| Hawaiian Gardens | 72 | 104 |
| Lakewood | 1308 | 140 |
| La Mirada | 72 | 104 |
| L.A. County | 475 | - |
| Norwalk | 635 | 644 |
| Parmount | 366 | 440 |
| Pico Rivera | 1181 | 171 |
| Santa Fe Springs | 166 | 1663 |
| S. Whittier | 123 | - |
| Whittier | 992 | 1388 |
| TOTAL | 6493 | 6408 |

1) Source: Recommended Transit Improvement Plan for Los Angeles Mid-Cities Area, CENTS Final Report, May, 1975.

TABLE III-3

CHARACTERISTICS OF RIDERS BOARDING AND ALIGHTING IN MID-CITIES AREA

| | SEX | | AGE | | | | | NO. OF AUTOS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | Male | Female | 16 | 16-24 | 25-44 | 45-64 | 65 | 0 | 1 | 2 | 3 |
| 34 | 31.3 | 68.8 | 2.0 | 18.0 | 32.0 | 42.0 | 6.0 | 33.3 | 43.1 | 17.6 | 5.9 |
| 38 | 33.3 | 66.7 | 6.9 | 20.7 | 20.7 | 31.0 | 20.7 | 56.7 | 26.7 | 13.3 | 3.3 |
| 55 | 64.8 | 35.2 | 3.0 | 23.5 | 31.1 | 37.1 | 5.3 | 32.1 | 39.7 | 22.1 | 6.1 |
| 58 | 47.5 | 52.5 | 5.8 | 15.5 | 32.0 | 32.0 | 14.6 | 41.0 | 33.0 | 23.0 | 3.0 |
| 72 | 52.5 | 47.5 | 1.9 | 32.7 | 35.6 | 26.0 | 3.8 | 37.1 | 36.2 | 18.1 | 8.6 |
| 111 | 25.6 | 74.4 | 10.6 | 21.3 | 25.5 | 27.7 | 14.9 | 51.1 | 37.8 | 8.9 | 2.2 |
| 112 | 40.0 | 60.0 | 0 | 25.0 | 25.0 | 25.0 | 25.0 | 58.3 | 33.3 | 8.3 | 0 |
| 113 | 24.5* | 75.5 * | 5.9 | 27.5 | 21.6 | 41.2 | 3.9 | 40.4 | 40.4 | 15.4 | 3.8 |
| 116 | 47.6 | 52.4 | 15.6 | 26.7 | 33.3 | 8.9 * | 15.6 | 35.0 | 37.5 | 15.0 | 12.5 |
| 117 | 29.6 | 70.4 | 5.6 | 22.2 | 13.0 * | 25.9 | 33.3 * | 30.9 | 47.3 | 16.4 | 5.5 |
| 118 | 68.0 | 32.0 | 0 | 15.4 | 42.3 | 23.1 | 19.2 | 46.2 | 34.6 | 19.2 | 0 |
| 132 | 28.2 | 71.8 | 13.5 | 32.4 | 29.7 | 18.9 | 5.4 | 36.8 | 28.9 | 21.1 | 13.2 * |
| 134 | 55.6 | 44.4 | 0 | 40.0 | 50.0 | 10.0 | 0 | 36.4 | 36.4 | 18.2 | 9.1 |
| 136 | 41.7 | 58.3 | 8.0 | 32.0 | 44.0 | 16.0 | 0 | 19.2 | 46.2 | 30.8 | 3.8 |
| 137 | 48.4 | 51.6 | 3.2 | 25.8 | 35.5 | 32.3 | 3.2 | 31.3 | 40.6 | 21.9 | 6.3 |
| Weighted Average | 40.9 | 59.1 | 6.0 | 26.5 | 30.5 | 25.8 | 11.2 | 35.5 | 39.0 | 18.7 | 6.8 |
| 95-Percent Confidence Interval | ±3.6 | ±3.6 | ±1.7 | ±3.1 | ±3.3 | ±3.1 | ±2.2 | ±3.4 | ±3.5 | ±2.8 | ±1.8 |

TABLE III-3

(continued)

| Line | TYPE OF FARE | | | | | EDUCATION | | |
|---|---|---|---|---|---|---|---|---|
| | Cash Fare | Cash Fare & 10¢ | Transfer | Monthly Pass | Other | Elem | High School | College |
| 34 | 34.0 | 17.0 | 1.9 | 47.2* | .0 | 13.5 | 57.7 | 28.8 |
| 38 | 51.9 | 18.5 | 11.1 | 14.8 | 3.7 | 15.4 | 53.8 | 30.8 |
| 55 | 51.5 | 9.0* | 6.7 | 30.6 | 2.2 | 9.5* | 61.9 | 28.6 |
| 58 | 40.6 | 21.8 | 3.0 | 29.7 | 5.0 | 24.2 | 46.5 | 29.3 |
| 72 | 33.7* | 15.4 | 5.8 | 42.3* | 2.9 | 17.8 | 59.4 | 22.8 |
| 111 | 53.2 | 21.3 | 2.1 | 19.1 | 4.3 | 19.0 | 64.3 | 16.7 |
| 112 | 50.0 | 8.3 | .0 | 41.7 | .0 | 16.7 | 66.7 | 16.7 |
| 113 | 50.9 | 22.6 | 7.5 | 18.9 | .0 | 27.5 | 54.9 | 17.6 |
| 116 | 57.1 | 23.8 | 9.5 | 9.5 | .0 | 29.7 | 56.8 | 13.5 |
| 117 | 58.2 | 14.5 | 1.8 | 16.4 | 9.1 | 17.6 | 68.6 | 13.7 |
| 118 | 44.4 | 7.4 | 7.4 | 37.0 | 3.7 | 20.8 | 58.3 | 20.8 |
| 132 | 55.0 | 20.0 | 7.5 | 2.5* | 15.0 | 18.4 | 55.3 | 26.3 |
| 134 | 41.7 | 25.0 | 8.3 | 25.0 | 0.0 | 10.0 | 50.0 | 40.0 |
| 136 | 42.3 | 30.8 | 3.8 | 19.2 | 3.8 | 20.0 | 60.0 | 20.0 |
| 137 | 56.3 | 18.8 | 6.3 | 9.4 | 9.4 | 9.7 | 51.6 | 38.7 |
| Weighted Average | 48.4 | 18.6 | 5.3 | 22.6 | 5.1 | 18.2 | 58.6 | 23.2 |
| 95 Percent Confidence Interval | ±3.5 | ±2.8 | ±1.6 | ±3.0 | ±1.6 | ±2.8 | ±3.6 | ±3.1 |

TABLE III-3
(continued)

MODE TO AND FROM BUS FOR PERSONS BOARDING AND ALIGHTING WITHIN MID-CITIES AREA

| | MODE TO BUS | | | | | MODE FROM BUS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Line | Walk | Drove | Was Driven | Transfer | Other | Walk | Drove | Was Driven | Transfer | Other |
| 34 | 67.9 | 11.3 | 13.2 | 5.7 | 1.9 | 62.5 | 6.3 | 0 | 31.3 | 0 |
| 38 | 45.0* | 5.0 | 20.0 | 30.0 | 0 | 76.9 | 0 | 7.7 | 15.4 | 0 |
| 55 | 69.2 | 3.1 | 7.7 | 20.0 | 0 | 88.8* | 1.3 | 3.8 | 6.3* | 0 |
| 58 | 59.2 | 11.8 | 14.5 | 13.2 | 1.3 | 73.3 | 0 | 4.4 | 22.2 | 0 |
| 72 | 59.1 | 17.1* | 13.6 | 8.0 | 2.3 | 73.0 | 0 | 5.4 | 13.5 | 8.1 |
| 111 | 81.3 | 3.1 | 3.1 | 12.5 | 0 | 81.5 | 0 | 0 | 18.5 | 0 |
| 112 | 100.0 | 0 | 0 | 0 | 0 | 75.0 | 0 | 0 | 25.0 | 0 |
| 113 | 82.5 | 0 | 0 | 17.5 | 0 | 77.5 | 2.5 | 0 | 20.0 | 0 |
| 116 | 80.5 | 2.4 | 4.8 | 9.8 | 2.4 | 66.7 | 0 | 0 | 30.3 | 3.0 |
| 117 | 84.2 | 0 | 1.8 | 10.5 | 3.5 | 67.9 | 0 | 0 | 26.8 | 5.4 |
| 118 | 65.4 | 11.5 | 7.7 | 15.4 | 0 | 83.3 | 0 | 0 | 16.7 | 0 |
| 132 | 85.4 | 0 | 2.4 | 12.2 | 0 | 78.4 | 0 | 0 | 21.6 | 0 |
| 134 | 83.3 | 0 | 0 | 16.7 | 0 | 66.7 | 0 | 0 | 33.3 | 0 |
| 136 | 92.9* | 0 | 0 | 7.1 | 0 | 46.2* | 0 | 0 | 50.0* | 3.8 |
| 137 | 52.6 | 5.3 | 10.5 | 26.3 | 5.3 | 87.5 | 0 | 0 | 0 | 12.5 |
| Weighted Average | 74.3 | 5.2 | 6.3 | 12.4 | 1.8 | 72.2 | 0.7 | 1.2 | 22.1 | 3.8 |
| 95 Percent Confidence Interval | ±3.5 | ±1.8 | ±1.9 | ±2.6 | ±1.1 | ±4.2 | ±0.8 | ±1.0 | ±3.8 | ±1.8 |

TABLE III-3
(continued)

NUMBER OF DIFFERENT BUSES

| Line | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| 34 | 12.2 | 34.7 | 51.0 | 2.0* |
| 38 | 8.0 | 32.0 | 48.0 | 12.0 |
| 55 | 11.6 | 48.8 | 35.7 | 3.9 |
| 58 | 14.6 | 31.3 | 41.7 | 12.5 |
| 72 | 5.7 | 40.0 | 47.6 | 6.7 |
| 111 | 15.6 | 33.3 | 42.2 | 8.9 |
| 112 | 0 | 66.7 | 33.3 | 0 |
| 113 | 18.4 | 34.7 | 34.7 | 12.2 |
| 116 | 19.5 | 41.5 | 31.7 | 7.3 |
| 117 | 6.1 | 55.1 | 30.6 | 8.2 |
| 118 | 14.8 | 37.0 | 33.3 | 14.8 |
| 132 | 2.6* | 53.8 | 35.9 | 7.7 |
| 134 | 0 | 36.4 | 45.5 | 18.2 |
| 136 | 20.0 | 24.0 | 36.0 | 20.0 |
| 137 | 21.9 | 37.5 | 34.4 | 6.3 |
| Weighted Average | 11.4 | 41.9 | 38.1 | 8.6 |
| 95 Percent Confidence Interval | ±2.3 | ±3.6 | ±3.5 | ±2.0 |

TABLE III-3
(continued)

TRIP PURPOSE FOR PERSONS BOARDING AND ALIGHTING IN MID-CITIES AREA

| Line | Work | Shop | School | Social/ Rec | Medical | Other |
|---|---|---|---|---|---|---|
| 34 | 76.5* | 5.9* | 7.8 | 3.9 | 3.9 | 2.0* |
| 38 | 22.2* | 18.5 | 0 | 7.4 | 14.8 | 37.0* |
| 55 | 75.0* | 5.3* | 3.8 | 9.8 | .8* | 5.3 |
| 58 | 55.1* | 14.3 | 2.0* | 16.3* | 3.1 | 9.2 |
| 72 | 76.2* | 6.9* | 7.9 | 5.0 | 2.0 | 2.0* |
| 111 | 33.3* | 16.7 | 9.5 | 7.1 | 19.0 | 14.3 |
| 112 | 50.0 | 33.3 | 0 | 16.7 | 0 | 0 |
| 113 | 62.7 | 5.9* | 5.9 | 9.8 | 7.8 | 7.8 |
| 116 | 26.8* | 31.7 | 22.0 | 4.9 | 7.3 | 7.3 |
| 117 | 43.6 | 34.5* | 5.5 | 1.8* | 5.5 | 9.1 |
| 118 | 74.1 | 7.4 | 3.7 | 0 | 11.1 | 3.7 |
| 132 | 29.7* | 32.4 | 2.7 | 5.4 | 13.5 | 16.2 |
| 134 | 40.0 | 0 | 20.0 | 30.0 | 0 | 10.0 |
| 136 | 66.7 | 7.4 | 11.1 | 3.7 | 3.7 | 7.4 |
| 137 | 66.7 | 6.7 | 10.0 | 6.7 | 0 | 10.0 |
| Weighted Average | 54.9 | 17.0 | 8.2 | 6.4 | 5.5 | 8.0 |
| 95 Percent Confidence Interval | ±3.6 | ±2.7 | ±2.0 | ±1.3 | ±1.6 | ±2.0 |

Overall averages indicate that 59 percent of the riders in the Mid-Cities area are female. The only line with a statistically different proportion of riders by sex is Line 113, a local route that runs between Whittier and Compton, passing through Pico Rivera, Downey, and Paramount. The reason for this is not apparent from the other available data. The only other deviation from the average Mid-Cities route for Line 113 is for trip purpose where the proportion of shopping trips is low. This would seem to run counter to the larger proportion of females since shopping trips are predominantly made by females.

Approximately 30 percent of the patrons in the Mid-Cities area are between the ages of 25 and 44. Lines 116 and 117, two local lines have proportions that are different from the average. One-third of the riders on Line 117 are 65 or older. This compares to 11 percent for the Mid-Cities area. Line 117 services the area north of Whittier, where the census data has tracts with greater than 20-percent of the inhabitants being senior citizens. Line 117, which serves four major shopping areas, has the highest (34.5 percent) proportion of shopping trips by transit which correlates with the large proportion of older patrons.

The average number of autos per household for the transit riders in the Mid-Cities area is slightly less than one auto per household (0.97). Census data for the Mid-Cities area indicates 1.6 autos per household. The only line that shows any statistical deviation from the average for the area is Line 132 which has the highest percentage of patrons having 3 or more cars per household. Line 132, which stays within the Mid-Cities area for its entire length, passes through census tracts that have the full range of auto ownership categories. There is no apparent reason why the auto ownership is different. The other three categories (0, 1, and 2 auto per household ) do not differ statistically from the remainder of the lines.

Nearly one-half the riders in the Mid-Cities area pay a cash fare only and 19 percent pay cash and buy a transfer. Twenty-four percent of the riders use a transfer either when they board a bus in the Mid-Cities area or when they alight from one. Approximately 23 percent of the riders use a monthly pass. Line 34 and 72 have the highest percentage of patrons using monthly passes, 47.2 and 42.3 percent respectively. Both lines connect the Mid-Cities area with downtown Los Angeles and have relatively short headways for the area. Both lines have a statistically higher than average proportion of work trips. Since work trips are normally fairly regular in frequency, it is not surprising to find a high proportion of monthly passes on these lines. Line 132, which has the lowest proportion of monthly passes, also has a significantly lower number of work trips. The predominant trip purpose on line 132 is shopping.

Eighty-two percent of the Mid-Cities riders have at least a high school education. Only Line 55 deviates from the average distribution for the area with a low proportion of "elementry school only" educated riders.

Of those persons boarding a bus within the Mid- Cities area, 74

percent walk to the bus. A nearly equal percent of those persons alighting from buses within the area walk to their destination. Only 11 percent of the patrons are driven or drive to a bus in the Mid-Cities area. Line 136, a local bus in Pico Rivera has the highest proportion of people who walk to the bus, nearly 93 percent. Those people that leave the bus have a statistically lower walking percentage and a higher transfer proportion than the other buses in the area. Line 136 is not unusual in any other way. Line 38 has the lowest proportion of people that access the bus by walking and the highest number that transfer to it. Line 38 has the smallest proportion of work trips also. This is probably due to the 240 minute headway during the peak hours.

The patrons were asked on the survey to indicate the number of different lines they ride to reach their final destination. The responses to this question were none, one, two, or three or more. The presence of "none" as a response would indicate that if no transfers are made-then none should be checked - even though one bus line is required to reach the final destination. The results shown in Table III-3 for this variable must be viewed with this in mind for it is not clear how a person who transfers once, for example, would respond. Comparing this variable to the type of fare paid produces some questionable results. Forty-six percent of the persons boarding in the Mid-Cities area may possibly transfer at least once. This figure can be obtained by adding those who pay a cash fare and buy a transfer, those who use a transfer, and those who use a monthly pass. Since at least some of those using monthly passes do not tranfer, 46 percent is the maximum that transfer. Over 88-percent of the people have indicated that they need at least one different bus to reach their final destination i.e., at least 88 percent indicate they transfer. Although the two percentages vary from line to line, the difference between these two questions would seem to indicate that the results, at least for number of buses, is suspect. It is probable that some patrons that checked "1" meant that they only ride one bus, i.e., they do not transfer.

The greatest number of differences between lines appear for the trip purpose category of Table III-3. For work trips, all those lines that are above average for the Mid-Cities area have downtown Los Angeles as one of their termini while all those lines that have less than the average proportion of work trips are local lines that either end or are totally within the Mid-Cities area. Line 117 with twice as many shopping trips as the other lines, serves five major shopping areas. Those lines that have less shopping trips than the average have more work trips than average. Line 58 has proportionately about three times as many social/recreational trips as the average Mid-Cities line. This line serves both Disneyland and Knott's Berry Farm just outside the Mid-Cities area.

## TRAVEL BETWEEN AREA

Table III-4 presents a distribution of trips taken between the various communities within the Mid-Cities area. The table does not show these trips to areas outside the area or those trips where only the on or off stop was given by the transit rider. The community boundaries are the same as those given in Table II-3. The greatest number of trips are those that both

TABLE III - 4

DISTRIBUTION OF TRIPS BETWEEN COMMUNITIES

| | PICO RIVERA | WHITTIER | DOWNEY | SANTA FE SPRINGS | NORWALK | LA MIRADA | PARAMOUNT | BELLFLOWER | LAKEWOOD | ARTESIA | CERRITOS | HAWAIIAN GARDENS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PICO RIVERA | 151 | 57 | 7 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| WHITTIER | | 875 | 28 | 226 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DOWNEY | | | 163 | 8 | 64 | 0 | 14 | 92 | 48 | 8 | 0 | 24 |
| SANTA FE SPRINGS | | | | 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NORWALK | | | | | 74 | 40 | 50 | 56 | 8 | 8 | 0 | 32 |
| LA MIRADA | | | | | | 0 | 8 | 24 | 0 | 0 | 0 | 0 |
| PARAMOUNT | | | | | | | 44 | 66 | 0 | 0 | 0 | 0 |
| BELLFLOWER | | | | | | | | 28 | 42 | 0 | 0 | 0 |
| LAKEWOOD | | | | | | | | | 2 | 0 | 0 | 8 |
| ARTESIA | | | | | | | | | | 0 | 8 | 40 |
| CERRITOS | | | | | | | | | | | 0 | 0 |
| HAWAIIAN GARDENS | | | | | | | | | | | | 0 |

originate and terminate within the area defined as Whittier. Table III-5 is a reproduction of a table from the CENTS final report. It presents the travel time between communities for the Mid-Cities bus system before the new service was implemented. Of the 78 pairs, sixteen have travel times of over 2 hours. Only two of the sixteen pairs with travel time of two hours or more have any transit users traveling between them. These two pairs are between La Mirada and Pico Rivera and La Mirada and Paramount. There are 24 pairs where travel time is less than one hour. Of these 24 pairs, 16 have at least some transit riders traveling between each.

TABLE III-5

TRAVEL TIME - PRESENT SYSTEM [1]

| | PICO RIVERA | WHITTIER | SANTA FE SPRINGS | DOWNEY | PARAMOUNT | NORWALK | LA MIRADA | BELLFLOWER | ARTESIA | LAKEWOOD | CERRITOS | HAWAIIAN GARDENS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PICO RIVERA | | 45 | 85 | 105 | 151 | 92 | 132 | 185 | 161 | 202 | 176 | 188 |
| WHITTIER | 45 | | 82 | 93 | 139 | 119 | 87 | 143 | 158 | 269 | 173 | 185 |
| SANTA FE SPRINGS | 85 | 82 | | 71 | 117 | 37 | 114 | 87 | 76 | 161 | 91 | 103 |
| DOWNEY | 105 | 93 | 71 | | 76 | 41 | 118 | 80 | 80 | 59 | 95 | 107 |
| PARAMOUNT | 151 | 139 | 117 | 76 | | 86 | 133 | 36 | 86 | 80 | 101 | 113 |
| NORWALK | 92 | 119 | 37 | 41 | 86 | | 77 | 50 | 39 | 111 | 54 | 66 |
| LA MIRADA | 132 | 87 | 114 | 118 | 137 | 77 | | 97 | 52 | 158 | 97 | 109 |
| BELLFLOWER | 185 | 143 | 87 | 80 | 36 | 50 | 97 | | 80 | 74 | 95 | 107 |
| ARTESIA | 161 | 158 | 76 | 80 | 86 | 39 | 52 | 80 | | 85 | 45 | 57 |
| LAKEWOOD | 202 | 269 | 161 | 59 | 80 | 111 | 158 | 74 | 85 | | 100 | 112 |
| CERRITOS | 176 | 173 | 91 | 95 | 101 | 54 | 97 | 95 | 45 | 100 | | 42 |
| HAWAIIAN GARDENS | 188 | 185 | 107 | 107 | 113 | 66 | 109 | 107 | 57 | 112 | 42 | |

Points are from City Halls of each City.
All times listed are in minutes of bus running time plus average waiting time and transfer time, if applicable

[1] Source: Recommended Transit Improvement Plan for Los Angeles Mid-Cities Area, CENTS Final Report May, 1975.

## SECTION IV

## RECOMMENDATIONS FOR FURTHER ANALYSIS

The purpose of collecting the data described and analyzed in this report was to compare it to data collected from patrons using the new service. This report falls short of the goal of evaluating the new service. As mentioned previously, the data from the survey taken after the new service went into effect was not available by the expiration date of the contract. Therefore, this chapter is devoted to specifying what steps should be undertaken to analyze the data from the new service and what comparisons need to be made in order to determine whether the objectives of the new service are being met.

The first step in the analysis of the new service would be to enumerate both the specific and general objectives of the new service. Specific objectives would be those that are specific to the area of the new service. General objectives are those that would be objectives of any improved transit service anywhere.

Table IV-1 lists a number of specific and general objectives that can be used to evaluate the new service by comparing it to the old service. Table IV-1 also lists measures that can be used to compare the two services in relation to these objectives.

Additional effort should be spent to analyze exactly where people who use the transit service come from. This data can be used to analyze and compare the service area profiles for the old lines and the new lines. The data needed to do this analysis is the home address indicated on the on-board survey. The on-board survey taken on the old service has had all the addresses coded. Key punching of this data was not undertaken since the data by itself, i.e., without the after data, would not reveal much. Two specific questions can be answered using this data. First, are patrons coming from the same distance to access a specific line and lines in general in the area. Second, if riders are coming from different distances, can this be attributed to a more or less attractive service that is being provided by the new structure of lines within the area.

The evaluation effort should reveal exactly where the new service is leading to accomplishment of the objectives set forth and where it is not. This information could be used to "tune-up" the service being provided.

TABLE IV - 1

EVALUATION OF NEW SERVICE

| General Objectives | Measures |
|---|---|
| 1. Fewer Number of Transfers | 1. Change in distribution of transfers required to reach final destination. |
| 2. Increase in ridership of transit dependent (young, old, handicapped, no autos) | 2. Change in distribution of age of riders, number of autos in household. |
| 3. Reduced travel time between destinations. | 3. Change in patronage levels between communities where travel time has changed. |
| 4. Increased use of transit for various trip purposes. | 4. Change in distribution of trip purpose. |
| 5. Increased access to transit lines. | 5. Change in distribution of mode to bus. |
| 6. Serve new travel patterns of Mid-Cities communities. | 6. Change in distribution/volume of trips to various destinations within/outside area. |

TABLE IV - 1 (continued)

EVALUATION OF NEW SERVICE

| Specific Objectives | Measures |
|---|---|
| 1. Improve service to Cerritos College | 1. Change in volume of persons going to Cerritos College by transit. |
| 2. Improve access to Mid-Cities and Long Beach Shopping centers for respective patrons. | 2. Change in volume of persons going to various shopping centers by transit. |
| 3. Improve access to Whittwood Shopping Center and Whittier Boulevard corridor. | 3. Change in volume of persons going to Whittwood Shopping Center and Whittier Boulevard corridor. |
| 4. Improve access between South and Mid-Cities Area. | 4. Change in volume of patronage traveling between areas. |

# APPENDICES

APPENDIX A

SAMPLE SIZE ESTIMATION

This appendix will describe the technique used to estimate the required minimum sample size calculated for each bus line. The symbols used in the following equations are:

$\hat{P}_i$ : Estimated proportion of an attribute of riders on bus line i

$n_i$ : Sample size for bus line i

$S(\hat{P}_i)$ : Standard error of $P_i$

$N_i$ : Total daily ridership on line i

The standard error is set at 0.05 and we wish to find the minimum sample size that satisfies the following inequality:

$$S(\hat{P}_i) \leq 0.05 \qquad (1.)$$

If the attribute of interest is the number of females on bus line i, then $N_i P_i$ would be the number of females where $P_i$ is the proportion of females on line i. The number of females in the sample on line i is distributed according to the hypergeometric distribution since we are sampling without replacement, i.e., no rider will fill out more than one questionnaire. The standard error of the estimate of the proportion is then given by the formula:

$$S(\hat{P}_i) = \sqrt{\frac{P_i(1 - P_i)(N_i - n_i)}{n_i(N_i - 1)}} \qquad (2.)$$

Combining equations (1.) and (2.) produces

$$\sqrt{\frac{P_i(1 - P_i)(N_i - n_i)}{n_i(N_i - 1)}} \leq 0.05 \qquad (3.)$$

Since $P_i$ is unknown, and in fact we are trying to estimate its value which is a function of the sample, we must use an estimate of it in order to solve equation (3.) for the value of $n_i$. The maximum value of the minimum sample size for each line is obtained when $P_i = 0.5$. We can thus use this estimate in order to be conservative in the computation of the

sample size. This assumption is actually not that critical since the function $P_i(1-P_i)$ is nearly constant over the range of $P_i$ values from .25 to .75.

Solving equation (3.) with $P_i = 0.5$ and knowing that $N_i$, $n_i$, and $N_i - n_i$ are all positive yields

$$n_i \leq \frac{100\ N_i}{99 + N_i} \qquad (4.)$$

Hence $n_i$, the minimum sample size, is the smallest integer which exceeds

$$\frac{100\ N_i}{99 + N_i} \qquad (5.)$$

where $N_i$ is the total daily ridership on the line. Because of the criterion regarding geographic locations of addresses, the minimum sample size required is defined as the greater of $n_i$ as computed above or 10 percent of the estimated daily riders.

The 10 percent limitation was arrived at by considering the data requirements needed to investigate specific geographic areas along routes. Data on these geographic areas would be obtained from both the household survey and the on-board survey. It was decided that a standard error in the estimate of percentage response rate in each area should be not more than 10 percent. Given this lower bound on the precision of the estimate, the sample size required to obtain this level of precision was calculated as follows:

The standard error of the estimate is

$$\sqrt{\frac{p_j(1-p_j)}{n}} \qquad (6.)$$

where

n = sample size
$p_j$ = estimated proportion of riders in area j with attribute

Since $p_j$ is unknown, we assume p = .5, which gives the maximum estimate of the standard error of proportions. Hence,

$$\sqrt{\frac{(0.5)(1-0.5)}{n}} \leq .10 \qquad (7.)$$

Solving equation (7.) for n yields:

$$n \geq 25 \qquad (8.)$$

The sample size for each area of interest must therefore be no smaller than 25 to obtain no more than a 10 percent standard error of estimate of percentage response.

APPENDIX B

LINE 34

CHECKER #1

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 3 | Allington/Bellflower | 6:05 a.m. | Alameda/103rd St. | 6:43 a.m. |
| 2 | Alameda/103rd St. | 7:08 a.m. | Allington/Bellflower | 7:38 a.m. |
| 2 | Allington/Bellflower | 7:45 a.m. | Alameda/103rd St. | 8:24 a.m. |
| 1 | Alameda/103rd St. | 8:40 a.m. | Allington/Bellflower | 9:15 a.m. |
| 1 | Allington/Bellflower | 9:40 a.m. | Alameda/103rd St. | 10:14 a.m. |
| 3 | Alameda/103rd St. | 10:40 a.m. | Allington/Bellflower | 11:15 a.m. |

EXPECTED RIDERS: 140
CHECKER TIME: 5:10
SERIAL NO: 10001 - 10180

LINE 38

CHECKER #2

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 1 | El Monte | 8:08 a.m. | Long Beach | 9:50 a.m. |
| 1 | Long Beach | 10:08 a.m. | El Monte | 11:52 a.m. |
| 1 | El Monte | 12:10 p.m. | Long Beach | 1:52 p.m. |
| 1 | Long Beach | 2:08 p.m. | El Monte | 3:56 p.m. |

EXPECTED RIDERS: 50
CHECKER TIME: 7:48
SERIAL NO. : 10181 - 10250

# LINE 46

CHECKER #3

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 5 | Green Valley Circle/ Sepulveda | 5:57 a.m. | Cudahy | 6:59 a.m. |
| 5 | Cudahy | 7:05 a.m. | Green Valley Circle/ Sepulveda | 8:08 a.m. |
| 1 | Green Valley Circle/ Sepulveda | 8:27 a.m. | Cudahy | 9:31 a.m. |
| 1 | Cudahy | 9:45 a.m. | Green Valley Circle/ Sepulveda | 10:48 a.m. |

EXPECTED RIDERS: 260
CHECKER TIME: 5:51
SERIAL NO. : 10251 - 10541

CHECKER #4

| | | | | |
|---|---|---|---|---|
| 7 | Green Valley Circle/ Sepulveda | 6:47 a.m. | Cudahy | 7:49 a.m. |
| 7 | Cudahy | 8:05 a.m. | Green Valley Circle/ Supelveda | 9:08 a.m. |
| 5 | Green Valley Circle/ Sepulveda | 9:27a.m. | Cudahy | 10:31 a.m. |
| 5 | Cudahy | 10:45 a.m. | Green Valley Circle/ Supelveda | 11:48 a.m. |

EXPECTED RIDERS: 240
CHECKER TIME: 5:01
SERIAL NO.: 10541 - 10830

## LINE 54

CHECKER #5

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 7 | Lynwood | 6:37 a.m. | Westchester | 8:02 a.m. |
| 7 | Westchester | 8:31 a.m. | Lynwood | 9:52 a.m. |
| 7 | Lynwood | 10:05 a.m. | Westchester | 11:27 a.m. |
| 7 | Westchester | 11:50 a.m. | Lynwood | 1:10 a.m. |

EXPECTED RIDERS: 350
CHECKER TIME: 6:33
SERIAL NO.: 10831 - 11280

CHECKER #6

| | | | | |
|---|---|---|---|---|
| 8 | Playa Del Rey | 6:48 a.m. | South Gate | 7:52 a.m. |
| 8 | South Gate | 8:10 a.m. | Playa Del Rey | 9:16 a.m. |
| 8 | Playa Del Rey | 9:29 a.m. | South Gate | 10:32 a.m. |
| 8 | South Gate | 10:45 a.m. | Playa Del Rey | 11:49 a.m. |

EXPECTED RIDERS: 350
CHECKER TIME: 5:01
SERIAL NO.: 11281 - 11680

# LINE 55

CHECKER #7

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 52 | Seal Beach | 5:57 a.m. | Olympic/Arizona | 7:06 a.m. |
| 51 | Olympic/Arizona | 7:28 a.m. | Belmont Shore | 8:32 a.m. |
| 8 | Belmont Shore | 8:49 a.m. | LA RTD Station | 10:04 a.m. |
| 51 | LA RTD Station | 11:40 a.m. | Seal Beach | 1:01 p.m. |

EXPECTED RIDERS: 70
CHECKER TIME: 7:05
SERIAL NO.: 11681 - 11810

CHECKER #8

| | | | | |
|---|---|---|---|---|
| 2-36 | Seal Beach | 6:30 a.m. | LA RTD Station | 8:13 a.m. |
| 1 | LA RTD Station | 9:30 a.m. | Seal Beach | 10:48 a.m. |

EXPECTED RIDERS: 90
CHECKER TIME: 4:18
SERIAL NO.: 11811-11900

## LINE 58

CHECKER #9

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 52 (S) | Disneyland | 5:47 a.m. | LA RTD Station | 7:20 a.m. |
| 54 (S) | LA RTD Station | 7:25 a.m. | Disneyland | 8:47 a.m. |
| 5 (D) | Disneyland | 9:11 a.m. | LA RTD Station | 10:31 a.m. |
| 53 (S) | LA RTD Station | 10:50 a.m. | Disneyland | 12:03 p.m. |

EXPECTED RIDERS: 160
CHECKER TIME: 6:16
SERIAL NO.: 11901 - 12100

CHECKER #10

| | | | | |
|---|---|---|---|---|
| 4 (D) | LA RTD Station | 6:05 a.m. | Beach/Katella | 7:01 a.m. |
| 53 (D) | Beach/Katella | 7:19 a.m. | LA RTD Station | 8:44 a.m. |
| 56 (D) | LA RTD Station | 8:50 a.m. | Beach/Katella | 10:03 a.m. |
| 52 (S) | Disneyland | 10:36 a.m. | LA RTD Station | 12:04 p.m. |

EXPECTED RIDERS: 120
CHECKER TIME: 5:59
SERIAL NO.: 12101 - 12300

# LINE 72

CHECKER #11

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 2 | Whittier Station | 5:45 a.m. | 5th/Beaudry | 6:35 a.m. |
| 2 | 5th/Beaudry | 6:51 a.m. | Whittier Station | 7:45 a.m. |
| 2 | Whittier Station | 7:58 a.m. | 5th/Beaudry | 8:45 a.m. |
| 2 | 5th/Beaudry | 9:14 a.m. | Fullerton | 10:57 a.m. |

EXPECTED RIDERS: 200
CHECKER TIME: 6:21
SERIAL NO: 12301-12500

CHECKER #12

| | | | | |
|---|---|---|---|---|
| 4 | Whittier Station | 6:52 a.m. | 5th/Beaudry | 7:44 a.m. |
| 4 | 5th/Beaudry | 8:02 a.m. | Whittier Station | 8:55 a.m. |
| 4 | Whittier Station | 9:26 a.m. | 5th/Beaudry | 10:27 a.m. |
| 4 | 5th/Beaudry | 10:55 a.m. | Whittier Station | 11:31 a.m. |

EXPECTED RIDERS: 200
CHECKER TIME: 4:39
SERIAL NO: 12501 - 12700

## LINE 77

CHECKER #13

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 1 | Slauson/Eastern | 6:31 a.m. | Gage/Alamo | 7:06 a.m. |
| 1 | Gage/Alamo | 7:15 a.m. | Slauson/Eastern | 7:49 a.m. |
| 1 | Slauson/Eastern | 8:06 a.m. | Gage/Alamo | 8:41 a.m. |
| 1 | Gage/Alamo | 8:55 a.m. | Slauson/Eastern | 9:31 a.m. |
| 1 | Slauson/Eastern | 9:45 a.m. | Gage/Alamo | 10:20 a.m. |
| 1 | Gage/Alamo | 10:35 a.m. | Slauson/Eastern | 11:10 a.m. |

EXPECTED RIDERS: 270
CHECKER TIME: 4:39
SERIAL NO.: 12701 - 13050

CHECKER #14

| | | | | |
|---|---|---|---|---|
| 3 | Gage/Alamo | 6:20 a.m. | Slauson/Eastern | 6:52 a.m |
| 3 | Slauson/Eastern | 7:06 a.m. | Gage/Alamo | 7:41 a.m |
| 3 | Gage/Alamo | 7:55 a.m. | Slauson/Eastern | 8:29 a.m |
| 3 | Slauson/Eastern | 8:46 a.m. | Gage/Alamo | 9:21 a.m |
| 3 | Gage/Alamo | 9:35 a.m.* | Slauson/Eastern | 10:11 a.m |
| 3 | Slauson/Eastern | 10:22 a.m.* | Gage/Alamo | 11:58 a.m |

EXPECTED RIDERS: 270
CHECKER TIME: 4:38
SERIAL NO.: 13051 - 13400

# LINE 111

CHECKER #15

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 3 (B) | Bellflower | 7:25 a.m. | Huntington Park | 8:20 a.m. |
| 3 (A) | Huntington Park | 8:45 a.m. | Downey | 9:14 a.m. |
| 3 (A) | Downey | 9:25 a.m. | Huntington Park | 9:53 a.m. |
| 3 (B) | Huntington Park | 10:15 a.m. | Bellflower | 11:04 a.m. |
| 3 (B) | Bellflower | 11:30 a.m. | Huntington Park | 12:24 a.m. |
| 1 (B) | Huntington Park | 1:15 p.m. | Bellflower | 2:04 p.m. |

EXPECTED RIDERS: 100
CHECKER TIME: 6:39
SERIAL NO.: 13401 - 13550

CHECKER #16

| | | | | |
|---|---|---|---|---|
| 1 (A) | Downey | 6:31 a.m. | Huntington Park | 7:03 a.m. |
| 1 (A) | Huntington Park | 7:47 a.m. | Downey | 8:17 a.m. |
| 1 (A) | Downey | 8:25 a.m. | Huntington Park | 8:51 a.m. |
| 2 (A) | Huntington Park | 9:45 a.m. | Downey | 10:48 a.m. |

EXPECTED RIDERS: 90
CHECKER TIME: 4:52
SERIAL NO.: 13551 - 13650

# LINE 112

CHECKER #17

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 1 | Whittier Station | 7:05 a.m. | Huntington Park | 7:55 a.m. |
| 1 | Huntington Park | 8:00 a.m. | Whittier Station | 8:47 a.m. |
| 1 | Whittier Station | 9:00 a.m. | Huntington Park | 9:50 a.m. |
| 1 | Huntington Park | 10:00 a.m. | Whittier Station | 10:47 a.m. |

EXPECTED RIDERS: 60
CHECKER TIME: 3:42
SERIAL NO.: 13651 - 13710

# LINE 113

CHECKER #18

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| | Compton | 6:25 a.m. | Whittier Station | 7:20 a.m. |
| 1 | Whittier Station | 7:25 a.m. | Compton | 8:22 a.m. |
| 3 | Compton | 8:31 a.m. | Whittier Station | 9:26 a.m. |
| 3 | Whittier Station | 9:35 a.m. | Compton | 10:32 a.m. |

EXPECTED RIDERS: 80
CHECKER TIME: 3:53
SERIAL NO.: 13711 - 13840

LINE 116

CHECKER #19

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 2 | La Mirada | 7:02 a.m. | Compton | 7:56 a.m |
| 2 | Compton | 8:05 a.m. | La Mirada | 8:53 a.m |
| 2 | La Mirada | 9:07 a.m. | Compton | 9:59 a.m |
| 2 | Compton | 10:05a.m. | La Mirada | 10:53 a.m |
| 2 | La Mirada | 11:07 a.m. | Compton | 11:59 a.m |
| 2 | Compton | 12:05 p.m. | La Mirada | 12:53 p.m |

EXPECTED RIDERS: 110
CHECKER TIME: 5:51
SERIAL NO.: 13841 - 14010

# LINE 117

CHECKER #20

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 3 | Whittwood | 6:40 a.m. | Whittier Station | 7:05 a.m. |
| 3 | Whittier Station | 7:06 a.m. | Floral Drive/ Pioneer Avenue | 7:19 a.m. |
| 3 | Floral Drive/ Pioneer Avenue | 7:20 a.m. | Whittier Station | 7:37 a.m. |
| 3 | Whittier Station | 7:37 a.m. | Meyer/Leffington | 8:01 a.m. |
| 3 | Meyer/Leffington | 8:05 a.m. | Whittier Station | 8:29 a.m. |
| 3 | Whittier Station | 8:30 a.m. | La Mirada | 8:56 a.m. |
| 3 | Whittwood | 9:00 a.m. | Floral/Pioneer | 9:38 a.m. |
| 3 | Floral/Ioneer | 9:40 a.m. | Whittier Station | 9:57 a.m. |
| 3 | Whittier Station | 9:57 a.m. | Meyer/Leffington | 10:21 a.m. |
| 3 | Meyer/Leffington | 10:31 a.m. | Whittier Station | 10:55 a.m. |
| 3 | Whittier Station | 11:00 a.m. | Whittwood | 11:26 a.m. |

EXPECTED RIDERS: 140
CHECKER TIME: 5:46
SERIAL NO.: 14011 - 14110

# LINE 118

CHECKER #21

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 1 | Whittier Station | 6:30 a.m. | Olympic/Boyle | 7:10 a.m. |
| 1 | Olympic/Boyle | 7:15 a.m. | Whittier Station | 7:57 a.m. |
| 1 | Whittier Station | 8:00 a.m. | Olympic/Boyle | 8:40 a.m. |
| 1 | Olympic/Boyle | 8:55 a.m. | East Whittier | 9:47 a.m. |
| 1 | East Whittier | 9:47 a.m. | Olympic/Boyle | 10:40 a.m. |
| 1 | Olympic/Boyle | 10:55 a.m. | Whittier Station | 11:47 a.m. |

EXPECTED RIDERS: 80
CHECKER TIME: 5:17
SERIAL NO.: 14111 - 14210

LINE 132

CHECKER #22

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 1 | Lakewood | 6:53 a.m. | Hawaiian Gardens | 8:15 a.m. |
| 1 | Hawaiian Gardens | 8:45 a.m. | Lakewood | 10:11 a.m. |
| 1 | Lakewood | 10:53 a.m. | Hawaiian Gardens | 12:25 p.m. |
| 1 | Hawaiian Gardens | 12:45 p.m. | Lakewood | 2:11 p.m. |

EXPECTED RIDERS: 90
CHECKER TIME: 7:18
SERIAL NO.: 14211 - 14310

# LINE 134

CHECKER #23

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 1 | Whittier Station | 6:38 a.m. | Durfee/Elliott | 6:59 a.m. |
| 1 | Durfee/Elliott | 7:48 a.m. | Whittier Station | 8:18 a.m. |
| | Whittier Station | 8:57 a.m. | Durfee/Elliott | 9:18 a.m. |
| 1 | Durfee/Elliott | 10:08 a.m. | Whittier Station | 10:32 a.m. |

EXPECTED RIDERS: 60
CHECKER TIME: 3:54
SERIAL NO.: 14311 - 14410

LINE 136

CHECKER #24

| RUN NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 1 | Telegraph/Lakewood | 5:57 a.m. | Bartolo/Durfee | 6:16 a.m. |
| 1 | Bartolo/Durfee | 6:24 a.m. | Telegraph/Lakewood | 6:42 a.m. |
| 1 | Telegraph/Lakewood | 7:00 a.m. | Bartolo/Durfee | 7:20 a.m. |
| 1 | Bartolo/Durfee | 7:27 a.m. | Telegraph/Lakewood | 7:45 a.m. |
| 1 | Telegraph/Lakewood | 7:53 a.m. | Bartolo/Durfee | 8:13 a.m. |
| 1 | Bartolo/Durfee | 8:15 a.m. | Telegraph/Lakewood | 8:33 a.m. |
| 1 | Telegraph/Lakewood | 8:53 a.m. | Bartolo/Durfee | 9:13 a.m. |
| 1 | Bartolo/Durfee | 9:15 a.m. | Telegraph/Lakewood | 9:33 a.m. |

EXPECTED RIDERS: 110
CHECKER TIME: 3:36
SERIAL NO.: 14411 - 14510

# LINE 137

ECKER #25

| NO. | LEAVE | AT | ARRIVE | AT |
|---|---|---|---|---|
| 2 | Metropolitan State Hospital | 6:36 a.m. | Willowbrook | 7:10 a.m. |
| 5 | Willowbrook | 7:24 a.m. | Metropolitan State Hospital | 7:58 a.m. |
| 5 | Metropolitan State Hospital | 8:40 a.m. | Willowbrook | 9:14 a.m. |
| 3 | Willowbrook | 9:27 a.m. | Metropolitan Sate Hospital | 10:00 a.m. |
| 3 | Metropolitan State Hospital | 10:40 a.m. | Willowbrook | 11:14 a.m. |
| 2 | Willowbrook | 11:27 a.m. | Metropolitan State Hospital | 11:59 a.m. |

EXPECTED RIDERS: 190
CHECKER TIME: 5:23
SERIAL NO.: 14511 - 14760

TABLE C-1

UNIT RECORD LAYOUT

ON-BOARD SURVEY

| COLUMN | DESCRIPTION | VALUES |
|---|---|---|
| 1 | Blank | |
| 2-4 | Line Number | |
| 5 | Line Direction | 1 = North<br>2 = South<br>3 = East<br>4 = West |
| 6 | Mode to Bus Stop | 1 = Walked<br>2 = Drove<br>3 = Was Driven<br>4 = Transfered<br>5 = Other |
| 7-9 | On Stop | (see C-2) |
| 10-12 | Off Stop | (see C-2) chart |
| 13 | Mode from Bus | (see mode to bus) |
| 14 | Number of different bus Lines | 0 = none<br>1 = one<br>2 = two<br>3 = three or more |
| 15 | Trip Purpose | 1 = Work<br>2 = Shopping<br>3 = School<br>4 = Social/Recreational<br>5 = Medical<br>6 = Other |
| 16 | Type Fare | 1 = Cash fare<br>2 = Cash fare plus 10¢ for transfer<br>3 = Transfer bought on another bus<br>4 = Monthly pass<br>5 = Other |
| 17 | Person Type | 1 = the head of the household<br>2 = the wife/husband head of the household<br>3 = a child in the household<br>4 = a relative of household<br>5 = a boarder, employee, or friend living with household<br>6 = Other |

TABLE C-1 (continued)

| COLUMN | DESCRIPTION | VALUES |
|---|---|---|
| 18 | Sex | 1 = Male<br>2 = Female |
| 19 | Age | 1 = Under 16 years<br>2 = 16 to 24 years<br>3 = 25 to 44 years<br>4 = 45 to 64 years<br>5 = 65 years or more |
| 20 | Education | 1 = Elementry school<br>2 = High school<br>3 = College |
| 21 | Number of Autos | 0 = No cars<br>1 = one cars<br>2 = two cars<br>3 = three or more cars |
| 22-26 | Survey Number | |
| 27-30 | Time Bus Run Started | |
| 31 | Blank | |
| 32-35 | Time Bus Run Ended | |

TABLE C-2

CODES FOR ON/OFF STOP LOCATIONS

| Code | Area |
|---|---|
| 01 | Pico Rivera |
| 02 | Whittier |
| 03 | Downey |
| 04 | Santa Fe Springs |
| 05 | Norwalk |
| 06 | La Mirada |
| 07 | Parmount |
| 08 | Bellflower |
| 09 | Lakewood |
| 10 | Artesia |
| 11 | Cerritos |
| 12 | Hawaiian Gardens |
| 21 | Whittier Blvd. (N.W.) |
| 22 | Washington Blvd./Olympic/Telegraph/Santa Ana (NW) |
| 23 | Slauson/Huntington Park (W) |
| 24 | Firestone Blvd. (W) |
| 25 | Imperial Highway(W) |
| 26 | Compton (W) |
| 27 | Long Beach (S) |
| 28 | Lakewood (S) |
| 29 | Disneyland/Santa Ana (SE) |
| 30 | El Monte (N) |
| 90 | Los Angeles CBD |

TABLE C-3

UNIT RECORD LAYOUT

HOME ADDRESS CARD*

| Column | Description |
|---|---|
| 1-5 | Survey Number |
| 6-14 | House Number |
| 15-42 | Street Name |
| 43-47 | Apartment Number |
| 48-67 | City Name |
| 68-72 | Zip Code |

* ALL ENTRIES ARE LEFT JUSTIFIED

TABLE D-1

CONFIDENCE INTERVAL

FOR VARIOUS PROPORTIONS

AT 95-PERCENT

LEVEL

| Percent with Attribute | Number in Sample | | | | |
|---|---|---|---|---|---|
| P | 25 | 50 | 100 | 200 | 300 |
| 10% | ±11.8 | ± 8.3 | ±5.9 | ±4.2 | ±3.4 |
| 20% | ±15.7 | ±11.1 | ±7.8 | ±5.6 | ±4.5 |
| 30% | ±18.0 | ±12.7 | ±9.0 | ±6.3 | ±5.2 |
| 40% | ±19.2 | ±13.6 | ±9.6 | ±6.8 | ±5.6 |
| 50% | ±19.6 | ±13.9 | ±9.8 | ±6.9 | ±5.6 |