Technical Memorandum

Greater Portland Transit District (METRO)
Passenger On/Off Survey

Prepared By:
Greater Portland Council of Governments

In Cooperation With:
Greater Portland Transit District (METRO)

Prepared For:
Portland Area Comprehensive Transportation Committee (PACTS)
Maine Department of Transportation (MDOT)

December, 2002

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GREATER PORTLAND TRANSIT DISTRICT PASSENGER ON/OFF SURVEY

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A. INTRODUCTION

Overview

Every two years, the Greater Portland Council of Governments (GPCOG) conducts the On/Off Passenger Survey on behalf of the Greater Portland Transit District (METRO). The On/Off Survey counts the number of persons boarding and deboarding a METRO bus and derives useful bus route and stop information from these counts. One example of such date includes the average bus trip length in passenger miles, which is required to be reported to the Federal Transit Authority.

The survey is historically known as the "Brown Sheet Survey," named after the brown-colored spreadsheets displaying the results of the early surveys. The GPCOG transportation and land use planning division conducts the On/Off Survey as part of its role to provide planning assistance to the public transit operators in the region.

Purpose

The purpose of the survey is twofold:

1) to prepare an estimate of systemwide passenger miles for federal reporting requirements,

2) to provide stop-frequency data for planning passenger amenities such as bus shelters, bus stops and information kiosks.

Methodology

The On/Off Survey was conducted in April, considered a typical month for METRO ridership. The survey requires approximately 400 on-bus personnel hours to cover the entire METRO system. Staff positions are filled first by GPCOG and METRO staff, and the remaining hours by temporary personnel.

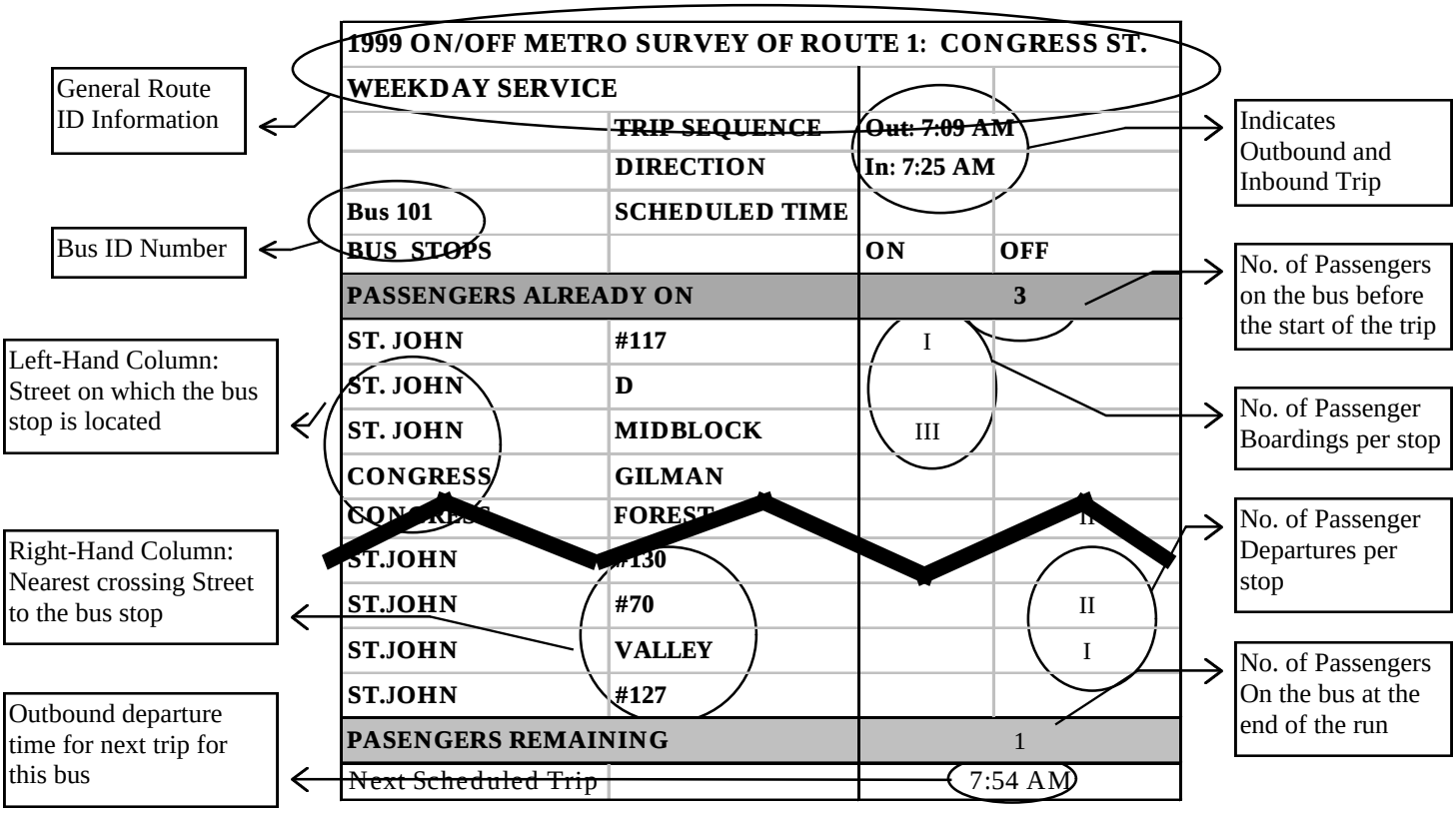
Each route is surveyed once, and an entire route's data is scheduled to be collected in one day. Scheduling the On/Off Survey has always been difficult, and 2001 was not an exception. Every attempt was made to complete each route in one single day, but due to scheduling difficulties, this was sometimes not possible. Weekday, Saturday, and Sunday routes are treated as independent routes in the survey. **Exhibit I** shows the daily schedule of the 2001 On/Off Survey. *Appendix A* contains maps for each route of the METRO system. *Appendix B* contains a copy of a METRO routes schedule at the time of the survey.

Exhibit I
METRO On/Off Survey Schedule
April 7-17 2001

Saturday, April 7	Route Two, Route Three, Route Six, Route Five
Sunday April 8	Route One, Route Four
Monday, April 9	Route Three, Route Six
Tuesday, April 10	Route Four
Thursday, April 12	Route Five
Friday, April 13	Route One, Route Eight
Saturday, April 14	Route One, Route Four, Route Eight
Tuesday, April 17	Route Two

Survey staffers ride the METRO buses and count the persons boarding and departing at each stop for an entire route day. This information is collected and marked on a survey sheet designed specifically for each bus and route. **Exhibit II** shows a portion of a completed sample survey sheet with an explanation of the sheet design. A copy of an entire blank survey form can be found in *Appendix C.*

Exhibit II
Sample Completed METRO On/Off Staff Survey Form



The METRO On/Off Survey directly collects two main statistics: boardings (i.e. ridership, ons or number of passengers) and departures (i.e. offs). The boarding/departure information is entered into a Microsoft Excel spreadsheet, which automatically calculates passenger mileage and other summary information. Passenger mileage information is calculated exclusively from the On/Off Survey data, and describes total bus ridership in terms of distance or passenger miles (i.e., five people riding the bus for one mile is equal to five passenger miles).

Using GPCOG's Geographic Information Systems (GIS) capabilities, the mapping department was able to plot each stop and measure the distance between them to the nearest one hundredth of a mile. It is anticipated that this detailed mapping will have many more uses as METRO embarks on Intelligent Transportation System (ITS) applications for transit.

Route passenger mileage is the summation of the passenger mileage at the individual stop. It should be noted that passenger mileage is an aggregate statistic, and thus does not describe riding characteristics of any individual passenger.

B. SUMMARY ON/OFF SURVEY RESULTS*

Boardings/Departures - On/Off System-wide Totals vs. Monthly Fare-Box Totals

The primary set of system-wide descriptive statistics collected by the On/Off Survey is passenger boardings. Departures are the natural counterpart to passenger boardings, but because departures are roughly equivalent to boardings, reporting both sets of data is redundant at this level of analysis.

The On/Off Survey counted 7,892 total boardings during the sample week. **Exhibit III** displays ridership distributions by route comparing it to actual farebox ridership counts for the corresponding days in April. Discrepancies between "actual ridership" and survey ridership may have to do with the way transfers are counted and both survey and operator error.

Tables comparing ridership for the 2001 survey with the 1999 survey are in ***Appendix E*.**

METRO Actual Daily Totals			On/Off Survey	
Route	**Actual Ridership**	**Percentage**	**Survey Ridership**	**Percentage**
1	1,232	16%	1,407	18%
2	1,056	14%	1,079	14%
3	625	8%	551	7%
4	2,086	27%	1,950	25%
5	1,644	21%	1,709	22%
6	471	6%	503	6%
8	667	9%	693	9%
Total	**7,781**	100%	**7,892**	100%

**Monthly fare-box Ridership information provided by the Greater Portland Transit District (METRO)*

The distribution of ridership by route reported in the On/Off Survey is very similar to actual daily ridership distributions. Route Four has the highest ridership in the On/Off survey with 1,950 boardings (25% of the total ridership of the On/Off Survey), followed closely by Route Five with 1,709 boardings (22%). The farebox totals show Route Four as having the highest ridership with 2,086 persons (27%) and Route Five with the second highest ridership of 1,644 persons (21%). Route Six has the lowest ridership for both the On/Off Survey (503 persons or 6%) and the farebox totals (471 persons or 6%).

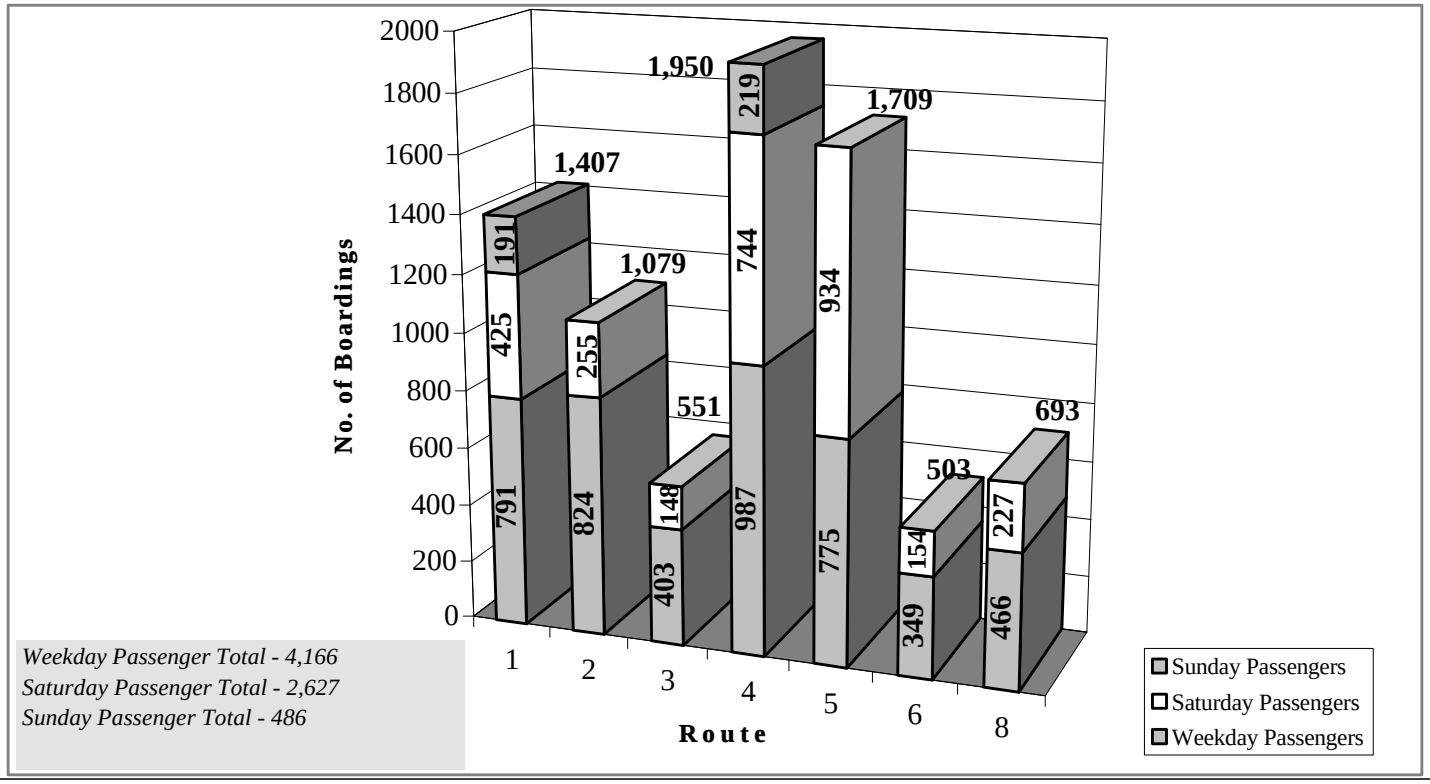
* For summary tables of the METRO On / Off Survey Results, see Appendix G - Summary Tables

Boardings/Departures - On/Off Totals by Route and Day

The On/Off Survey separates Weekday, Saturday, and Sunday routes to show differences in route characteristics by day. **Exhibit IV** displays the distribution of boardings by route for the On/Off Survey as in **Exhibit III**, but also shows how the different days of the week contribute to total route ridership.

Exhibit IV

Boardings by Route and Day



Reminder: The weekday category describes data for only one weekday during the week and not the aggregation of all weekdays during the week. This standard applies to daily data in the On/Off survey.

Exhibit IV displays passenger boardings by route in the following descending order: Route Four (1,950), Five (1,709), One (1,407), Two (1,079), Eight (693), Three (551) and Six (503). As this chart plainly shows, Routes Four, Five and One hold a larger proportion of the total system ridership than the other individual routes, although Route Two ranks third for weekday ridership.

Only Routes One and Four offer Sunday service. Sunday boardings make a small contribution to these routes' total ridership. Sunday service makes up 11% of the total ridership share on Route Four and a slightly larger portion of Route One's share at 14%.

Passengers riding METRO on weekdays constitute 58% of total ridership measured in the survey. Saturday boardings comprise 37% of total ridership share, and Sundays 5%. For nearly every route, the boardings on a typical weekday account for a greater number of a route's ridership than Saturday or Sunday boardings. The single exception is Route Five, whose Saturday passengers constitute 55% of the boardings on that route. Higher weekday ridership may be partially attributed to commuters, as well as limited Saturday and Sunday service. Route Five services the Maine Mall area of South Portland (see

Appendix A for route maps), and high Saturday ridership on that route likely results from Saturday shoppers.

Exhibit V

Percentage of Weekday Boardings by Route

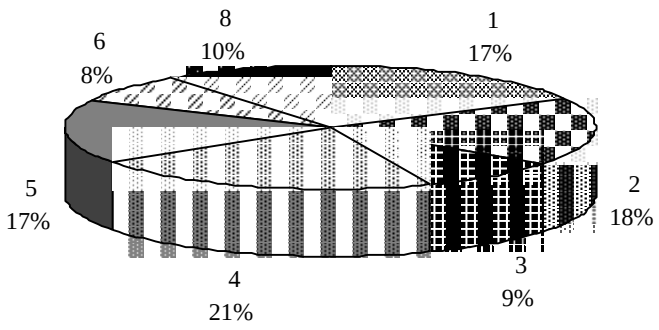


Exhibit VI

Percentage of Saturday Boardings by Route

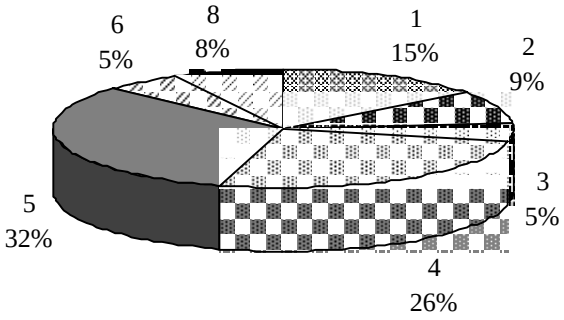
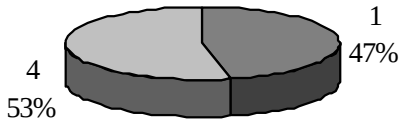


Exhibit VII

Percentage of Sunday Boardings by Route



Exhibits V, VI and VII isolate Weekday, Saturday and Sunday boardings to highlight distribution patterns attributable to weekday/weekend variations.

The boarding distribution of weekday routes (**Exhibit V**) and Saturday routes (**Exhibit VI**) is similar to the total boarding distributions shown in **Exhibit III**. Route Two showed the largest change, increasing from 12% in 1999 to 18% of weekly riders in 2001.

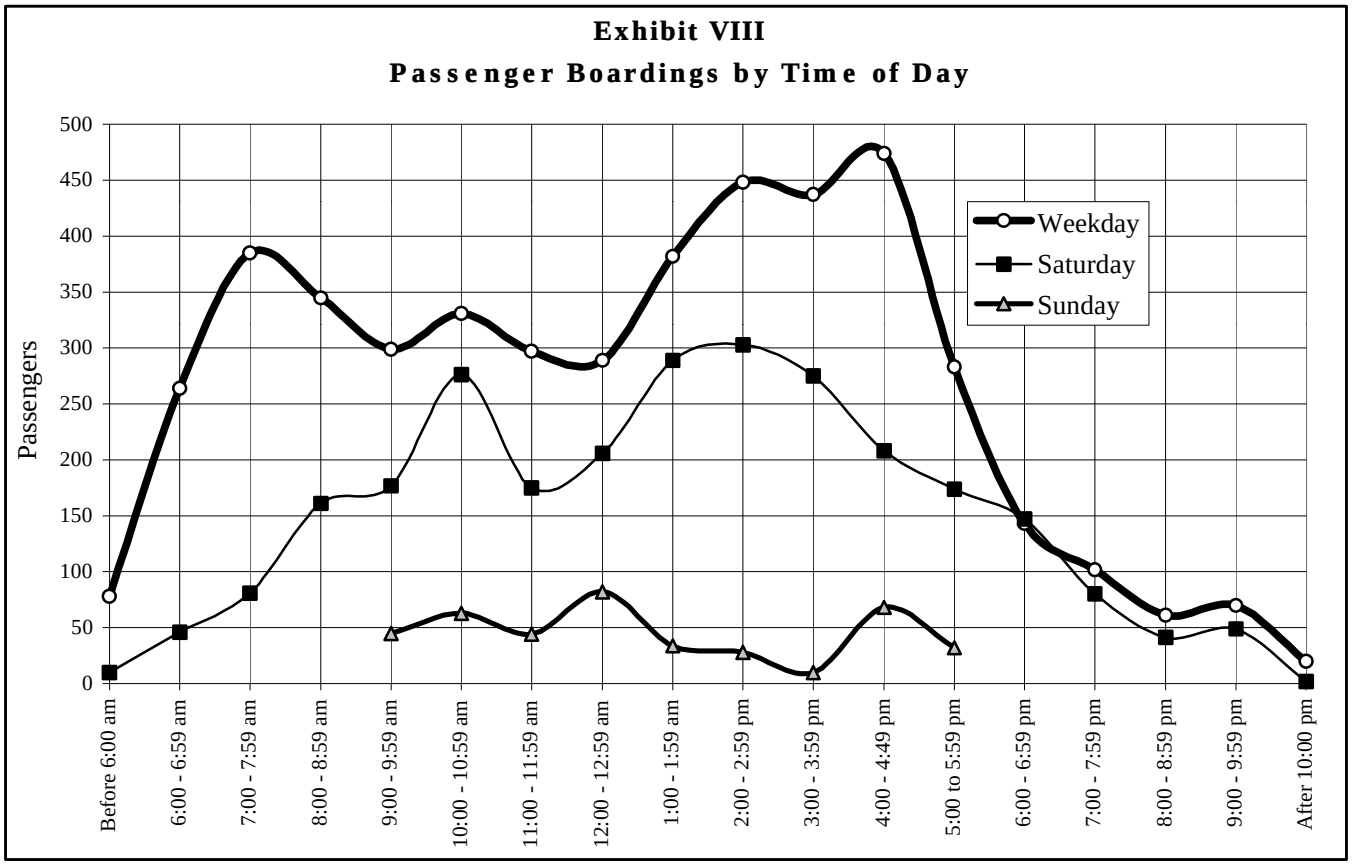
Route Five dropped 3% from 20% to 17%. Route Five carries 32% of all Saturday ridership, a 15% higher share than its weekday service and 6% higher than the next largest Saturday route. Route Four's share of Saturday passengers increased 2%, the largest change from 1999.

Routes Two and Three both capture a noticeably higher percentage of weekday boardings than Saturday boardings. This is probably due to commuter use of these two routes, which connect outlying residential areas to business districts (see *Appendix A* for route maps).

The two Sunday routes (One and Four) share a nearly equal percentage of boardings. However, while Route Four has increased to 53%, as shown in exhibit VII, Route One has seen a decrease of 7% to 47% from 1999.

Passenger Boardings by Time of Day

Exhibit VIII displays passenger boardings by time of day. Passenger boardings of the METRO transit system are combined and divided into their hourly components to show boarding trends within daily ridership (for Passenger Boardings/Departures by Time of Day for the Individual Routes, see *Appendix F*). Boarding times are not actual. Instead, they are determined by the starting time of the corresponding outbound or inbound trip.



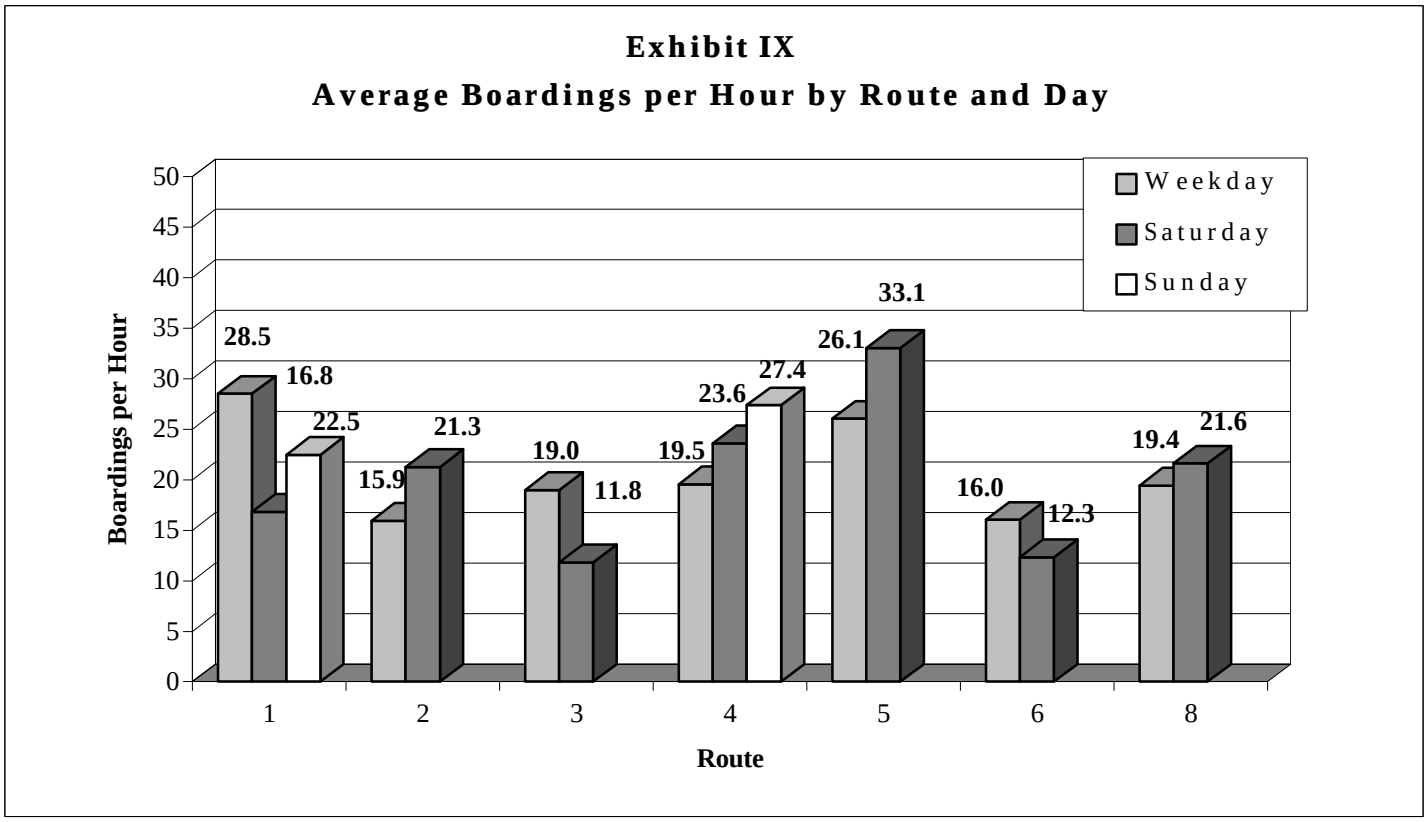
As **Exhibit VIII** shows, weekday boardings rise steadily from the onset of the service day, peaking at 7:00 to 7:59 A.M., then fall and rise once again to peak at 10:00 to 10:59 A.M. The highest weekday peak is experienced during 4:00 to 4:59 P.M., after which the number of boardings sharply drops until the end of the service day.

Saturdays follow similar boarding patterns as weekdays, with a series of peaks throughout the day. Saturday boardings rise steadily from the onset of the service day, experiencing the first peak at 10:00 to 10:59 A.M. A dip and another rise at 1:00 to 1:59 P.M. follow. The highest peak of the day occurs at 2:00 to 2:59 P.M., after which boardings gradually decline.

Sundays have no sharp peaks or drops in service. From the service day's onset at 8:00 to 8:59 A.M. until its close at 5:00 to 5:59 P.M., Sunday boardings remain relatively constant, experiencing only minor rises and drops.

Boardings per Hour

Another way to examine bus-boarding statistics is to divide the number of persons riding the bus by the total hours of bus service. Some bus routes have more riders because they have more buses in operation or longer service hours. Boardings per hour describe concentration of ridership, holding constant for differences in bus service hours.



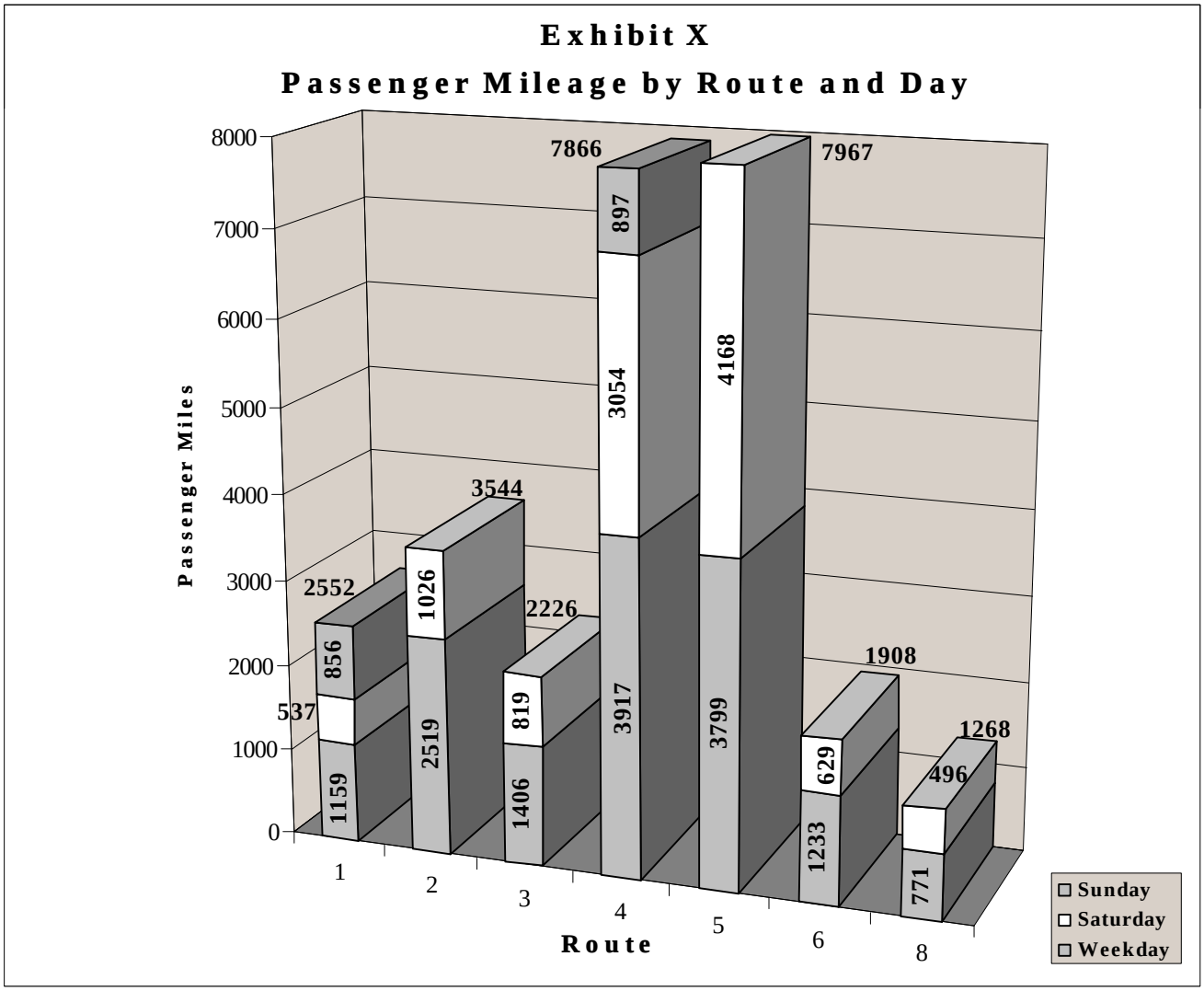
Route Five's high ridership rates (Exhibits III & IV) are echoed by its high concentration of passengers (Exhibit IX). Route Five Saturday has the highest concentration of passengers at 33.1 passengers per hour. Route Four weekdays and Saturdays also have high ridership, but only a mediocre concentration of passengers. This is primarily due to Route Four's longer service hours and more frequent service (i.e. more buses throughout the day) which reduce its overall passenger concentration.

The two Sunday Routes have low ridership totals, but relatively high per hour boarding rates. Route Four Sunday has the second highest concentration of passengers (27.4 passengers per hour). Existing Sunday routes are serviced by fewer buses and limited operating hours, but the service available is heavily used.

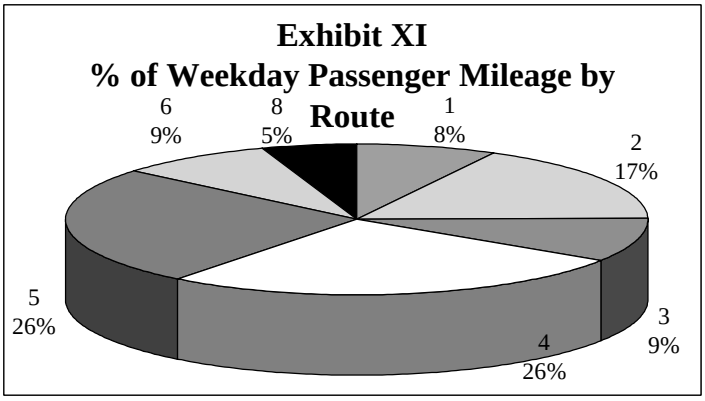
As shown by Exhibit IX, the concentration of ridership on weekdays compared to Saturdays seems to vary by route. Excluding Sunday service, Routes One, Three and Six have higher weekday concentrations. Routes Two, Four, Five and Eight have slightly higher Saturday boardings per hour.

Passenger Mileage

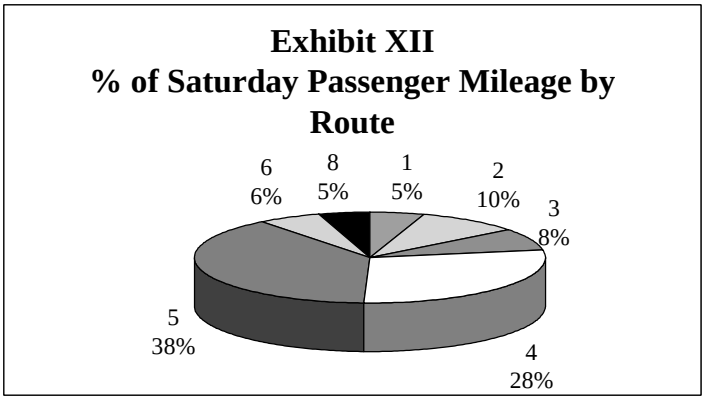
As stated in the methodology section, passenger mileage describes both how many persons are riding the bus and how far. **Exhibit X** shows passenger mileage by route and day.



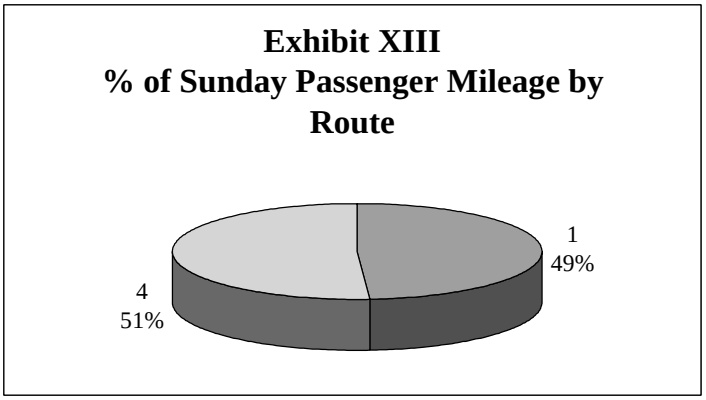
The distribution of passenger mileage follows a distribution pattern similar to boardings. Route Five has the highest total passenger mileage (7,967), followed by Routes Four (7,867), Two (3,544), One (2,551), Three (2,226), Six (1,908) and Eight (1,268). A single weekday constitutes 55% of all passenger mileage, Saturdays 39%, and Sundays 6%, similar to boardings. Route Five Saturday has the greatest daily passenger mileage of any route (4,168), followed by Route Four weekday (3,917), and Route Five weekday (3,799).



Routes Four and Five share the largest percentages of both weekday and Saturday passenger miles. Route Five's Saturday passenger mileage (38%) is a much larger share than its weekday mileage (26%). Route Four also has 26% of all weekday passenger mileage and 28% of Saturday's.



The shares for Routes Four and Five have both decreased from 1999, while all other routes have seen an increase. The increase in passenger mileage is especially dramatic in Route Two, which has gone from 12% to 17% on weekdays, and from 6% to 10% on Saturdays.



Route One's weekday passenger mileage was 8%, a 3% increase from 1999. Saturday mileage remained the same at 5%. Routes Six and Eight had a nearly equal share of the Saturday total passenger miles. Route Four's Sunday share of passenger mileage was 51%.

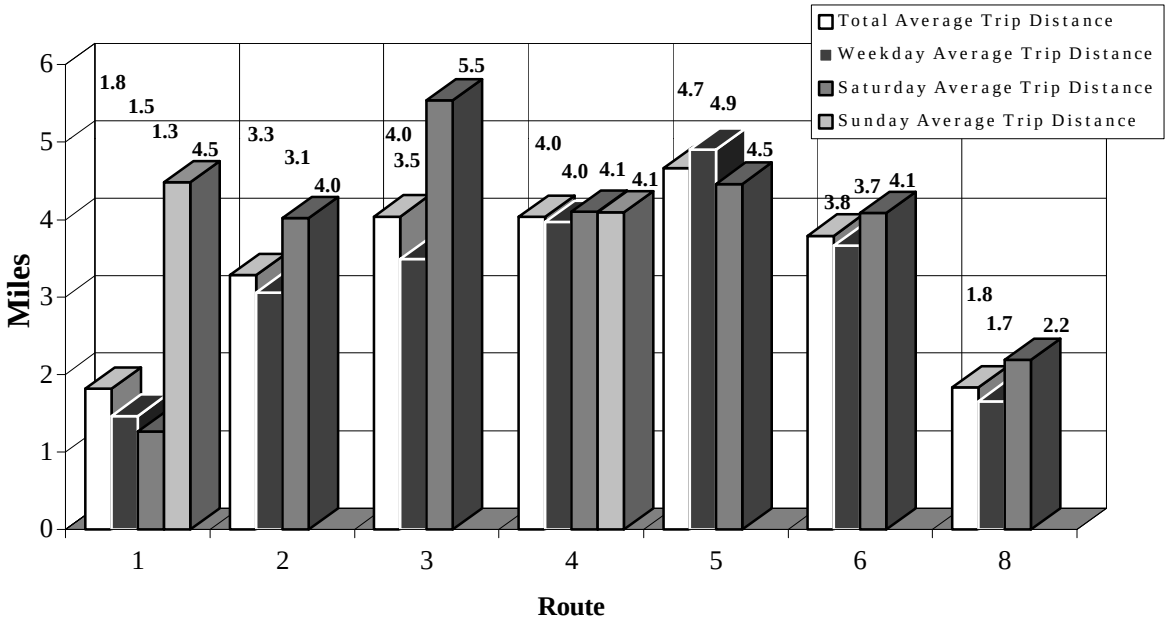
Exhibits XI, XII and XIII isolate weekday, Saturday and Sunday passenger mileage to highlight distribution pattern attributable to weekday/weekend variations.

Average Trip Distance

Average trip distance is obtained by dividing each route's passenger mileage by the number of passengers i.e. boardings. Average passenger trip distance describes the distance the average passenger travels on that route which is calculated by dividing the total passenger mileage for weekdays, Saturdays, and Sundays by the total number of passengers.

Exhibit XIV

METRO Average Trip Distance



As shown in **Exhibit XIV**, some routes have longer or shorter average trips, a byproduct of general trip geographical characteristics. Route Five has the longest average passenger trip distance (4.7 miles) for all days combined (total average trip distance). Route Three has the longest Saturday average trip distance (5.5 miles), a dramatic increase from 3.7 in 1999. Route Five has the longest weekday passenger trip distance (4.9). Routes Four and Three follow Route Five in total average trip distance (4 miles).

The Sunday highest average passenger trip distance of 4.5 miles goes to Route One. On the other hand, Route One is tied with Route Eight for a lowest total average trip distance of 1.8 miles. Route One's weekday trip distance is 1.3 miles, and its Saturday trip distance is only 1.2 miles. As the Route One map in *Appendix A* shows, Route One travels from intown Portland to the Maine Mall area of South Portland on Sunday, whereas its regular weekday and Saturday route travels up and down Congress Street. This added route mileage accounts for the increased average trip distance for Sunday.