Miami-Dade Transit

COMPREHENSIVE BUS OPERATIONAL ANALYSIS (CBOA)

Final Recommendations Report
December 2004

Prepared for:
Miami-Dade Transit

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EXECUTIVE SUMMARY

With the adoption of the People's Transportation Plan (PTP), an ambitious sequence of bus service improvements and system expansion is programmed for Miami-Dade County. Through new routes and system expansions, the system service hours, route miles, and bus fleet are planned to increase dramatically. Efficient service improvements need to be based on sound and up-to-date service planning information and monitoring systems, yet the last system-wide survey performed by MDT occurred in 1993. Updated system information is critical to the success of the PTP, if service enhancements are to both meet community needs and provide increased system efficiency.

The Comprehensive Bus Operational Analysis (CBOA) provides the planning information and monitoring baseline data from which planned PTP improvements can be fine tuned, new improvements can be determined, and implemented improvements can be monitored for their utilization.

The CBOA provides three large bodies of primary data:

1) a system-wide ride check to provide route and segment level operational performance data for every route;
2) a system-wide on-board passenger survey to determine trip characteristics, ridership profiles, community needs, and passenger satisfaction for each route; and
3) a survey of bus operators regarding schedule and operational improvements at a route and segment specific level.

In addition to providing much needed data for ongoing system and operations planning for MDT, the CBOA provides a route and route segment-level analysis of the operational efficiency. The analysis for the development of the service recommendations included nine basic components:

1) Duplication –alignment and service characteristics were compared to other routes along a similar corridor to consider consolidation
2) Purpose – consideration of branches, deviations, and end segments of a route being consistent with the target market service of the route
3) Travel Patterns – origin/destination patterns along with trip purposes and transfer results

4) Productivity – consideration of direct operating recovery ratio, and net cost per passenger trip to identify inefficient routes
5) Schedules – identification of problem segments for delay, poor productivity due to slow travel speeds, poor service, and fluctuating loads due to bunching
6) Route Length – to determine possible candidates for combination, and to look for problems in conjunction with scheduling due to long segments without recovery
7) Land Use – to determine and corroborate data showing poor utilization and to identify potential conflicts with residents' quality of life
8) Service Span – to identify loads showing potential to be shorted or the need to extend
9) History – consideration of MDT staff institutional knowledge regarding particular community needs and recommendations that have been tried before.

Through coordination of the route-level analyses and recommendations for service improvement, the CBOA includes various recommendations for increasing system efficiency and improving service quality to the County's transit customers. The detailed recommendations for improving and balancing transit service efficiency and quality have been provided in three deliverables:

1) Schedule recommendations for 22 routes in the November 2004 line-up to improve on-time performance and service reliability, based on ride-check data
2) Schedule recommendations for all remaining routes in the April 2005 line-up to improve on-time performance and service reliability, based on ride-check data
3) System-wide operational recommendations for all routes, as necessary, to improve the quality of service and system efficiency of resource utilization.

The last set of recommendations includes possible service improvements for increasing system efficiency, improving service to the County's transit customers, and providing better service to attract new ridership. The types of recommendations are listed below. More detailed descriptions are found on pages 24 through 26 of the report.

- Schedule Adjustments
- Headways/Frequency Adjustments

- Alignment Changes, including recombination of one segment to another, route extension, or route truncation
- Service Deletion
- New Service
- Route Combination

A summary of the recommendations starts on pages 28 of this report. Details of the recommendations are contained within each route section of the appendices. The service recommendations have two basic results:

1) Enhanced service is realized at a route and system level through increased coverage, faster and more reliable service, enhanced connectivity, fewer transfers, increased service span, or improved frequency/headway.

2) System efficiency is realized by enhanced service in conjunction with equipment savings from contraction and reallocation of unproductive services.

Most recommendations are intended to be implemented directly, while others support already scheduled PTP improvements, and some suggest monitoring poorly performing routes with subsequent discontinuation after additional marketing.

The sum of the impact of additive and contractive service recommendations (p. 28) for current implementation, starting on page 28, results in a savings of 19 buses and $4.5-million annual operating cost for reallocation to more productive community needs.

In addition to service recommendations, recommendations are provided in the *On-Going Monitoring Recommendations* section. The recommendations provide guidance for continuing the CBOA efforts on a periodic basis to provide timely service and operations planning information. They include:

1. Implement an Automatic Passenger Counters (APC) system on a minimum of 20% of the fleet, or up to 100% of the fleet for the best quality of information.

2. Implement a pilot program to assess and verify the capability of the APC system.

3. Provide a formal feedback loop with operators to augment APC data.

4. Use the APC system for capacity and load monitoring as well as scheduling.

5. System-wide alignment evaluation and planning should be scheduled for 5-year intervals and coordinated with the amendment cycle of the Miami-Dade County Comprehensive Development Master Plan (CDMP).

6. An on-board passenger survey should be conducted at 5-year intervals for alignment planning to provide trip characteristics data, including origin/destination data.

7. Passenger needs, attitudes, preferences, and demographics should be included in the on-board passenger survey.

8. To compliment the on-board survey data and analysis, and to help analyze the non-transit community's transportation needs, a telephone survey and public meetings should be conducted at a district level, sufficient to identify specific needs of individual communities.

BACKGROUND

With the adoption of the People's Transportation Plan (PTP), an ambitious sequence of bus service improvements and system expansion is programmed for Miami-Dade County. Through new routes and system expansions, the system service hours, route miles, and bus fleet are planned to increase dramatically. Highlights of the bus service improvements programmed for 2003 through 2008 include:

- Increase bus fleet from 700 to 1,191;
- Increase current annualized revenue miles from 27 million miles to 43.5 million miles, with the program of added service as follows:
  - FY 2003 4.5-million revenue miles added
  - FY 2004 2.1-million revenue miles added
  - FY 2005 3.3-million revenue miles added
  - FY 2006 3.6-million revenue miles added
  - FY 2007 3.5-million revenue miles added
- Increase operating hours from 1.9 million hours to 3.3 million hours;
- Utilize minibuses on all new bus routes and in neighborhood/municipal circulator shuttle service;
- Add midday, Saturday, and Sunday services within 30 days of approval of a dedicated funding source using existing buses;
- Provide 15-minutes or better bus service during peaks; 30 minutes or better during other periods; 24-hour service in certain major corridors;
- Replace buses on a systematic basis to reduce operating costs and increase reliability;
- Construct bus pull-out bays on major streets to expedite traffic flow;
- Implement a grid system for bus service (north-south and east-west) on major streets and avenues with circulator service feeding main-line bus service and rapid transit lines.

Efficient service improvements need to be based on sound and up-to-date service planning information and monitoring systems, yet the last system-wide survey performed by MDT occurred in 1993. Updated system information is critical to the success of the PTP, if service enhancements are to both meet community needs and provide increased system efficiency.

PTP IMPROVEMENT PROGRAM MAPS

As part of developing baseline information for the CBOA, the People's Transportation Plan (PTP) service improvements over the next five years have been mapped based on the PTP program as provided in April, 2004. The base year is depicted to the right, and the maps for Years 1 through 5 are provided on the following pages.

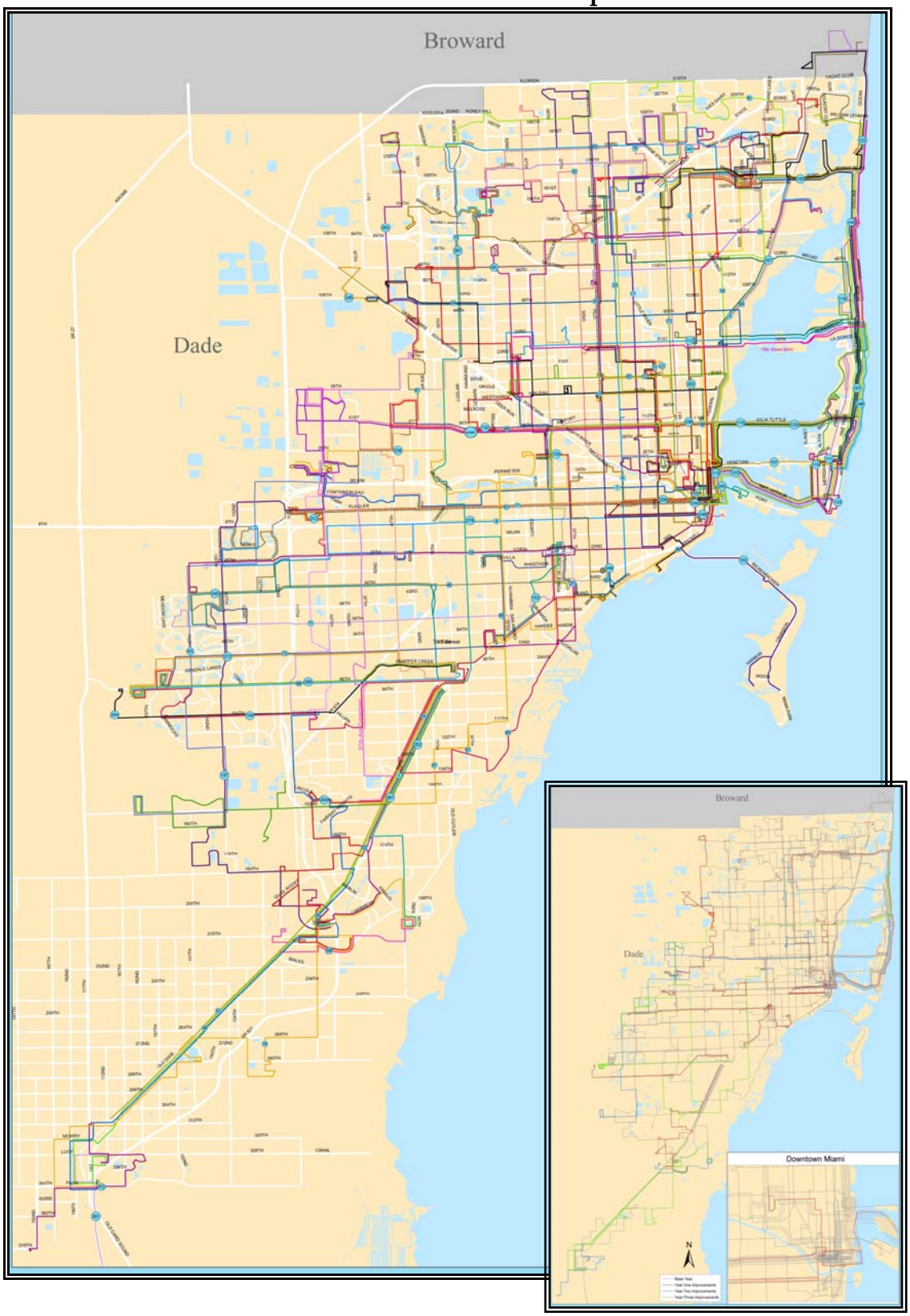
For each year, two maps are provided: one that shows the complete and cumulative system in color for each of the years, and another that shows the existing cumulative system for each year greyed, with only the added service for the respective year in color.

PTP Transit Network Year 1 – 2004
Inset: Year 1 Incremental Service Improvements

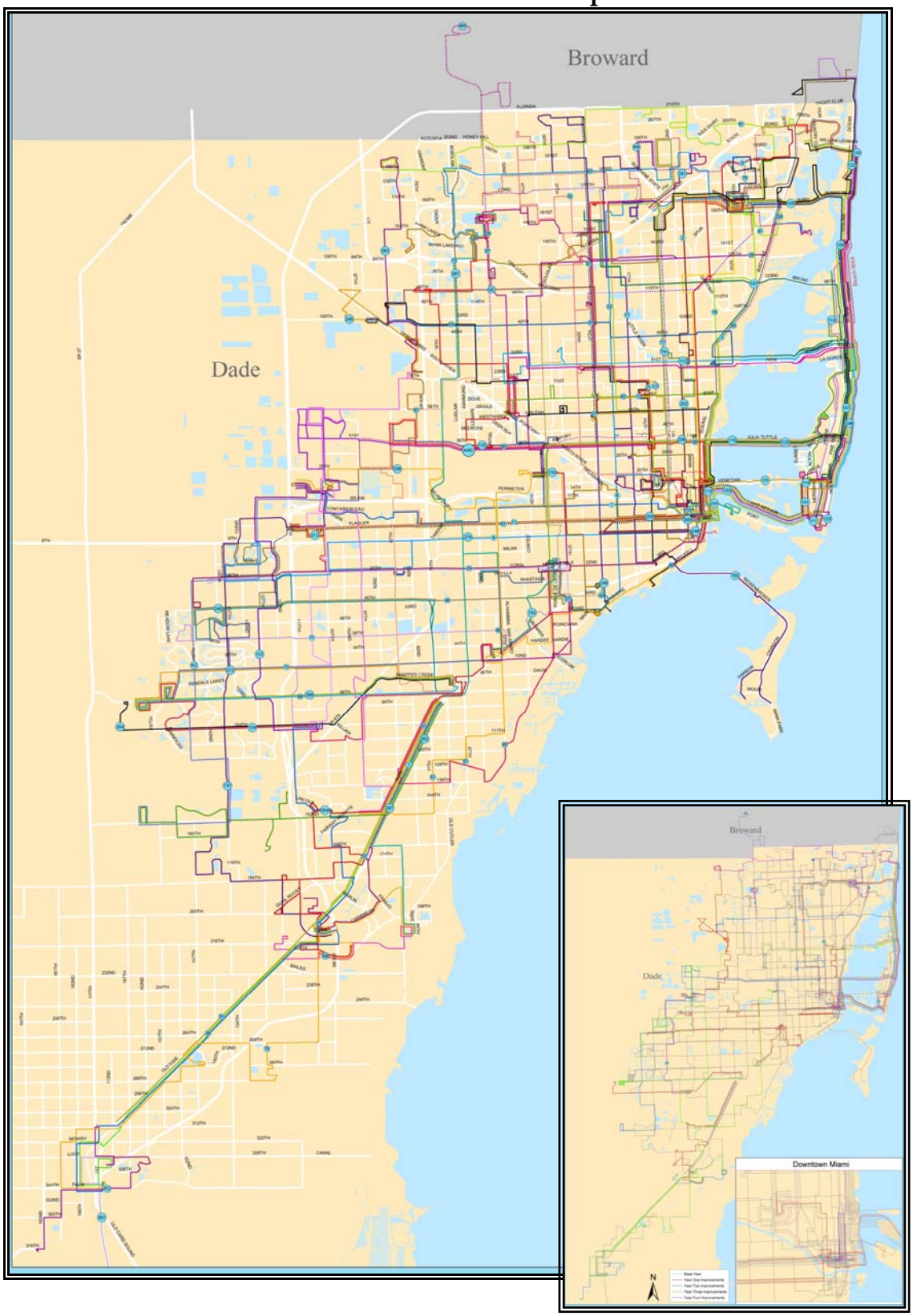
PTP Transit Network Year 2– 2005

Inset: Year 2 Incremental Service Improvements

PTP Transit Network Year 3– 2006
Inset: Year 3 Incremental Service Improvements



PTP Transit Network Year 4– 2007
Inset: Year 4 Incremental Service Improvements



PTP Transit Network Year 5– 2008

Inset: Year 5 Incremental Service Improvements

PURPOSE OF THE CBOA

The Comprehensive Bus Operational Analysis (CBOA) provides the planning information and monitoring of baseline data from which planned PTP improvements can be fine tuned, new improvements can be determined, and implemented improvements can be monitored. The CBOA provides three major bodies of primary data:

1) A system-wide ride-check survey provided route and segment level operational performance data for every route at sample rates of 80% for weekdays, 75% on Saturdays, and 50% on Sundays. The ride-check survey included every contemporary route in the system. Over 20 weeks of survey time logged 11,750 surveyed trips and approximately 14,900 platform hours. Over 1-million stop and time point records were generated, each containing boardings and debarkings for each stop as well as arrival and departure times at time points.

2) A system-wide on-board passenger survey was administered to determine passenger profiles and needs, trip characteristics, origin-destination patterns, and passenger satisfaction at a route level. The on-board passenger surveys produced approximately 28,000 surveys distributed according to route ridership. Each survey had 18 questions. Response rates for most questions were in the range of 90%. The origin-destination write-in questions, which typically have very low response rates for producing useful origin-destination pairs (often in the range of 30%), had a response rate for most routes in the range of 50% of the sample. Trip purpose response rates were in the range of 90%.

3) A survey of bus operators regarding scheduling, operational improvements, and passenger-stated issues at a route and segment specific level produced 718 surveys, providing 1,003 useful primary/secondary route responses. The results included: 1) operators' rating for their route's difficulty relative to other routes; 2) operator's opinion of predominant passenger complaints; 3) operators' problems that they encountered on a route. The surveys also indicated the segment along the routes for specific problem types, including: scheduling, overcrowding, and lack of shelters and benches.

In addition to providing much needed data for ongoing system and operations planning for MDT, the CBOA provides detailed recommendations for improving and balancing transit service efficiency and quality.

The CBOA provides a route and route segment-level analysis of the operational efficiency. Through coordination of the route-level analyses and recommendations for service improvement, the CBOA includes various recommendations for increasing system efficiency and improving service to the County's transit customers.

ROUTE PROFILES, NEW DATA, AND ANALYSES

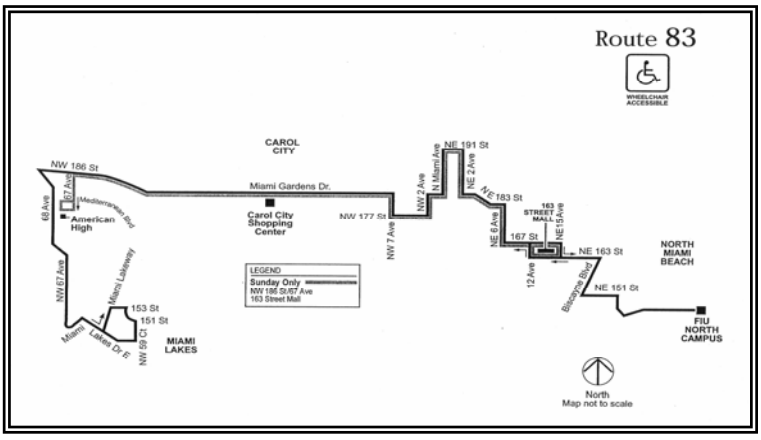
The three major data collection activities provide a wealth of current operational and user data throughout the system at route, segment, and stop levels of detail. The information is aggregated and summarized in the appendices to this report in both tabular and map formats as appropriate. This information is the summary of data that was used for the analysis and development of route recommendations. The actual raw data is also available in electronic and paper formats; however, there is only one copy of the paper formats as they take up approximately 30 file boxes.

For convenience, the appendices are divided into three volumes, within which all of the information is organized by route. The routes are organized in numerical order by their number designation. Volume I contains the information for Routes 1 through 51. Volume II contains the information for Routes 52 through 99, and Routes A (101) through M (113). Volume III contains the information for Routes R (118) through W (123), and Routes 132 (Tri-Rail/Koger Shuttle) through 288 (Kendall KAT). Volume III also contains at the end: copies of the passenger survey instrument in the three languages that it was provided (English, Spanish, Creole), the bus operator survey, and a sample copy of the ride-check forms.

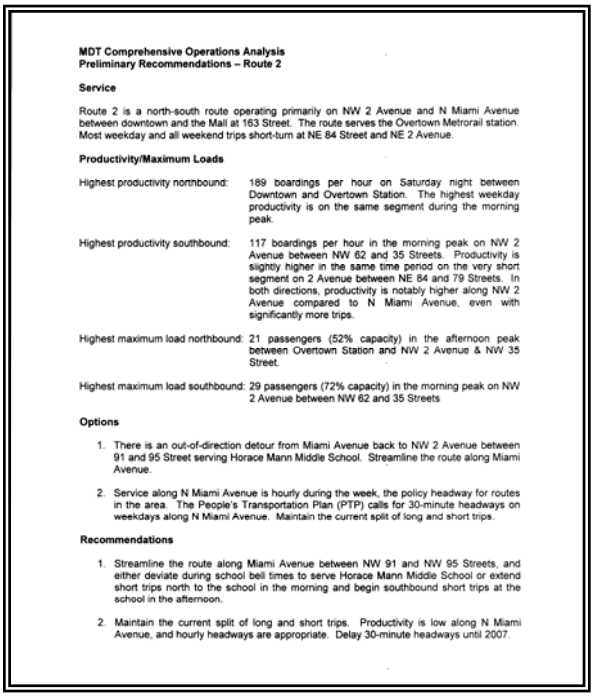
This section briefly describes: 1) the information contained in the appendices, 2) how it was used, and 3) its relationship to the data collection activities. Each of the analyzed routes in the appendices are separated by a title page and a color separator page. Each of these sections are in the format that is described below.

Title Page
The title page contains the route number, letter (Beach routes), and name.

Route Alignment Diagram
Provided to help familiarize the reader quickly, this is the official MDT alignment map.



Service Recommendations Detail
This page contains the detailed route service recommendations, the rationale for them, and their impacts. The recommendations



MDT Comprehensive Operations Analysis
Preliminary Recommendations – Route 2

Service

Route 2 is a north-south route operating primarily on NW 2 Avenue and N Miami Avenue between downtown and the Mall at 163 Street. The route serves the Overtown Metrorail station. Most weekday and all weekend trips short-turn at NE 84 Street and NE 2 Avenue.

Productivity/Maximum Loads

Highest productivity northbound: 189 boardings per hour on Saturday night between Downtown and Overtown Station. The highest weekday productivity is on the same segment during the morning peak.

Highest productivity southbound: 117 boardings per hour in the morning peak on NW 2 Avenue between NW 62 and 35 Streets. Productivity is slightly higher in the same time period on the very short segment on 2 Avenue between NE 84 and 79 Streets. In both directions, productivity is notably higher along NW 2 Avenue compared to N Miami Avenue, even with significantly more trips.

Highest maximum load northbound: 21 passengers (52% capacity) in the afternoon peak between Overtown Station and NW 2 Avenue & NW 35 Street.

Highest maximum load southbound: 29 passengers (72% capacity) in the morning peak on NW 2 Avenue between NW 62 and 35 Streets

Options

1. There is an out-of-direction detour from Miami Avenue back to NW 2 Avenue between 91 and 95 Street serving Horace Mann Middle School. Streamline the route along Miami Avenue.
2. Service along N Miami Avenue is hourly during the week, the policy headway for routes in the area. The People's Transportation Plan (PTP) calls for 30-minute headways on weekdays along N Miami Avenue. Maintain the current split of long and short trips.

Recommendations

1. Streamline the route along Miami Avenue between NW 91 and NW 95 Streets, and either deviate during school bell times to serve Horace Mann Middle School or extend short trips north to the school in the morning and begin southbound short trips at the school in the afternoon.
2. Maintain the current split of long and short trips. Productivity is low along N Miami Avenue, and hourly headways are appropriate. Delay 30-minute headways until 2007.

are discussed in more detail and summarized in the next sections of this report.

Schedule Recommendations Detail

The schedule recommendations were provided as two prior deliverables to MDT and are provided here in the same tabular format as originally provided. These recommendations were provided to MDT in April 2004 as inputs to the November 2004 line-up and in August 2004 as inputs to the April 2005 line-up. The purpose of the recommendations is to improve schedule adherence by updating bus schedule running time to better match actual observed running times through route segments. Roadway segments with multiple routes were coordinated. Recovery times were not changed by these recommendations.

For each route, two tables are provided, one for each direction. Each table is comprised of 10 columns. The first two list the beginning and endpoints for each segment in each direction. After these, there is a column for each of the time periods of analysis: AM Peak, Midday, PM Peak, Night, Saturday Day, Saturday Night, Sunday Day, and Sunday Night. Under each time period heading, and for each segment, a number shows the recommended number of minutes to add or subtract from the segment to improve schedule adherence.

The schedule recommendations are based on the ride-check survey's 1,017,620 data records from observations taken by surveyors on buses. Approximately 10% of the stops are time points; therefore, the basis of this analysis is in the range of 100,000 observations in which actual time-point arrivals and departures were recorded. Subsequent analysis determined actual segment travel time between time-points, and then averaged the multiple observations for each segment and each time period. Segment travel time, rather than time-point schedule deviation is used to negate any effects of cumulative early or late arrivals.

Route Operational Characteristics

The route operational characteristics are based on MDT data. The inputs include thirteen months of the most recent available ridership reports, and the Omnibus reports for all divisions for the November 21, 2004 line-up. All operational information is shown for weekday, Saturday, and Sunday service. Where applicable, values are shown for a weighted daily average.

The table contains average daily ridership data, as well as annual growth/contraction trends, month that is closest to average, high month, low month, and month-to-month variation. In addition: service span, headways, alignment distance, running time, and average speed are also summarized. Capacity is shown in terms of pull-out and equipment requirements, service distance, and service time. The distance and time sections include some important indicators of service efficiency, including: ratio of revenue miles to total miles, deadhead miles to total miles, revenue hours to platform hours, boardings per revenue hour, and boardings per seat-revenue hour. Finally, a revenue and cost section contains more performance indicators, including: net cost per passenger trip, and direct operating recovery ratio.

S, Route 119 Operating Characteristics — Central Division

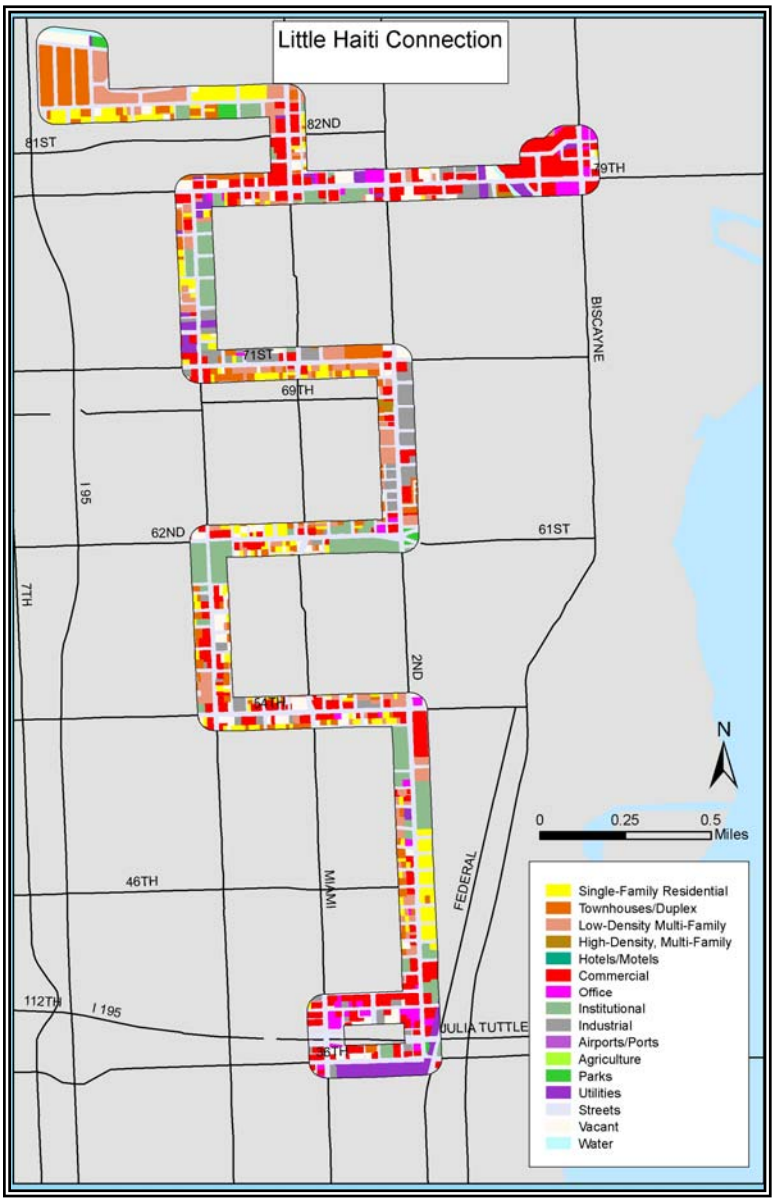
	Weekday	Saturday	Sunday	Daily Average
Daily Ridership (boardings) and Rank *(MDT Ridership Reports Nov.02 - Oct.03)*				
Interlined Route	no	no	no	not applicable
Annual Average Daily Ridership	11,815	11,224	8,853	11,307
Rank in System *(among 94 routes)*	2	1	1	2
Year's Ridership Trend *(Jan. 2003 to Jan. 2004)*	up 26%	up 5%	up 6%	19%
Month Closest to Annual Average	Jun.	Jul.	Apr.	not applicable
High Month *(with percent above average)*	Mar. +7%	Mar. +7%	Dec. +23%	not applicable
Low Month *(with percent below average)*	Sep. -4%	Jun. -7%	Nov. -31%	not applicable
Monthly Std. Dev. / Mean	4%	4%	14%	5%
Service Span				
Start Time *(24-hour clock face)*	4:29	4:29	4:34	not applicable
End Time *(24-hour clock face)*	5:14	5:14	5:12	not applicable
Total Service Span Hours *(24 hr. max.)*	24:0	24:0	24:0	24:0
Headways				
A.M. Peak Period	10	12	15	not applicable
Mid-Day	10	12	15	not applicable
P.M. Peak Period	10	12	15	not applicable
Night *(after 8 p.m.)*	10	20	20	not applicable
Distance & Speed				
Round Trip Alignment Distance *(miles)*	42.5	42.5	42.5	43
Round Trip Running Time *(hr:min)*	3:30	3:24	3:15	3:27
Round Trip Running Time *(observed hr:min)*	tbd	tbd	tbd	tbd
Schedule Average Speed *(mph)*	12.1	12.5	13.1	12.3
Observed Average Speed *(mph)*	tbd	tbd	tbd	tbd
Capacity & Equipment - Daily				
Daily Pull-Outs	24	20	16	22
AM Peak Pull Outs	21	17	13	19
PM Peak Pull Outs	21	17	13	19
Total 1-Way Trips	212	183	143	198
Equipment Type and Seats	full size bus	full size bus	full size bus	not applicable
Seats	40	40	40	0:0
Accessible	yes	yes	yes	not applicable
Bike Racks	yes	yes	yes	not applicable
Total Miles (day/trip)	5,080	4,361	3,476	4,748
Total Revenue Miles	4506 (89%)	3889 (89%)	3038 (87%)	4208 (89%)
Total Deadhead Miles	574 (11%)	472 (11%)	438 (13%)	540 (11%)
Seat Revenue Miles	180,236	155,568	121,532	168,326
Total Platform Hours *(hr:min)*	367:31	306:38	233:10	339:38
Revenue Hours (w/o recovery) *(hr:min)*	303:23 (83%)	252:49 (82%)	188:28 (81%)	279:45 (82%)
Scheduled Recovery Hours *(hr:min)*	41:16 (11%)	36:2 (12%)	28:55 (12%)	38:45 (11%)
Dead-Head Hours *(hr:min)*	22:52 (6%)	17:47 (6%)	15:47 (7%)	21:8 (6%)
Seat Revenue Hours	12,135	10,113	7,539	11,190
Boardings / Revenue Hour	**38.9**	**44.4**	**47.0**	**40.87**
Boardings / Seat Revenue Hour	**0.97**	**1.11**	**1.17**	**1.02**
Revenue & Costs *(Jan 2004 Ridership Report)*				
Revenue per Passenger Trip	$0.97	$0.84	$0.85	$0.93
Direct Operating Cost per Passenger Trip	$1.75	$1.55	$1.50	$1.68
Direct Operating Cost per Revenue Hour	**$68.01**	**$69.03**	**$70.69**	**$68.53**
Net Cost per Passenger Trip	**$0.78**	**$0.71**	**$0.65**	**$0.75**
Direct Operating Recovery Ratio	**55.5%**	**54.2%**	**56.7%**	**55.5%**
Operating Recovery Ratio Rank in System *(1 is highest)*	2	2	1	2
Daily Pull Outs Reduction for 50% Recovery Ratio	0 of 24	0 of 20	0 of 16	0 of 60total
New Net Cost per Passenger Trip at Reduction	$0.78	$0.71	$0.65	$0.75
Average Daily Total Savings for Reallocation	$0	$0	$0	$0
Ridership Increase to Meet 50% Recovery Ratio	-10%	9%	37%	-1%

MDT's available and newly calculated performance indicators are used in comparison to MDT's service standards, and to other routes of similar service in similar areas or

corridors. These comparisons are key inputs to the recommendations to identify inefficient routes, redundant service, and patterns of contracting utilization.

Route Coverage and Land Use Analysis Map

The Route Coverage and Land Use Analysis maps are also used as inputs to the final recommendation. Each map shows the route's alignment over the county or a portion of it (maps are scaled to the page size for best readability, with the scale shown). Along the route, its service area is shown as a band of coverage extending ¼ mile from each side of the alignment. The band is colored as appropriate to show the land use in the corridor, with a legend on each identifying all land uses shown on the map. The land use descriptions, and the colors used to denote them are consistent with the Miami-Dade County Comprehensive Development Master Plan (CDMP).



The land use information uses data obtained from the County's information technology department and MDT's information technology department.

The land use analysis maps are used in conjunction with productivity information and segment boardings data for identifying alignment segments that are less efficient uses of transit resources, based on established transit land use relationships and productivity criteria. For example, segments that show low productivity, when found to also be

characterized by predominantly single family residential land uses are more strongly considered for realignment or other reallocation of resources. Single family residential areas are typically not dense enough to warrant regularly-scheduled, high capacity transit service.

Route 33 Ridership Characteristics

	Weekday	Saturday	Sunday	Daily Average
Ridership (boardings) and Sample				
Annual Average (*MDT Ridership Reports Nov.02 - Oct.03*)	2,120	885	429	1,702
Sample	206	45	77	328
Percent Sample	9.7%	5.1%	18.0%	10.2%
Passenger Demographics				
Age Classification				
15 years or under	12.6%	0.0%	7.8%	10.1%
16 - 19 years	39.8%	24.4%	15.6%	34.2%
20 - 30 years	9.7%	13.3%	20.8%	11.8%
31 - 40 years	9.7%	22.2%	9.1%	11.4%
41 - 50 years	11.2%	17.8%	15.6%	12.7%
51 - 60 years	6.8%	13.3%	16.9%	9.2%
61 - 64 years	1.0%	0.0%	0.0%	0.7%
65 years or more	5.3%	2.2%	10.4%	5.6%
Percent Responding	*96.1%*	*93.3%*	*96.1%*	*95.7%*
Gender				
Female	51.0%	37.8%	48.1%	48.7%
Male	39.3%	44.4%	46.8%	41.1%
Percent Responding	*90.3%*	*82.2%*	*94.8%*	*89.8%*
Ethnic Origin				
Hispanic	44.2%	62.2%	64.9%	49.7%
African American	37.9%	17.8%	27.3%	33.5%
White / Non-Hispanic	3.4%	4.4%	2.6%	3.4%
Other	10.2%	4.4%	1.3%	8.1%
Percent Responding	*95.6%*	*88.9%*	*96.1%*	*94.7%*
Physical Disability				
Have Disability making it difficult to use MetroBus	6.3%	8.9%	5.2%	6.5%
Percent Responding	*96.6%*	*86.7%*	*97.4%*	*95.3%*
Passenger Household Demographics				
Number in Household	3.6	3.0	3.4	3.5
Percent Responding	*93.7%*	*91.1%*	*96.1%*	*93.7%*
Number of Vehicles in Household	1.2	0.8	0.9	1.1
Percent Responding	*95.1%*	*88.9%*	*93.5%*	*94.0%*
Vehicles per Person in Household	0.34	0.28	0.26	0.32
Household Income (average)	$16,675	$13,278	$14,156	$15,830
Percent Responding	*69.9%*	*71.1%*	*81.8%*	*71.8%*

Route Ridership Characteristics

The Route Ridership Characteristics tables provide passenger demographic information based on the on-board passenger survey that was performed as a part of the CBOA. The results from the passenger survey are broken out by weekday, Saturday, and Sunday for each route. The first three rows of the table show the sample of surveys obtained and percent of daily ridership sample for each day of week. Within this sample, the response rate per question is provided in italics below the possible responses for each question.

Below the sample statistics, the table summarizes the stated results obtained from questions 11 through 16 of the survey, providing passenger age cohort, gender, ethnic origin, physical disability, household size, household vehicles, and household income.

The information is used to signal key indicators of transit dependency and choice ridership among a route's markets. For example, school-age passengers and elderly passengers, as well as those from low-income households and households with no available vehicles are more often transit dependent. In addition to the averages for household size and number of vehicles in household, the number of vehicles per person in the household has been calculated to indicate greater need for transit alternatives in addition to total transit dependency. Alternatively, relatively higher household incomes, and higher auto ownership patterns by adult passengers indicates that the route is having greater penetration into choice transportation markets.

Route Transit Use & Passenger Satisfaction

The Route Transit Use & Passenger Satisfaction tables provide information regarding the patterns of transit use and customer satisfaction based on the on-board passenger survey that was performed as a part of the CBOA. The results from the passenger survey are broken out by weekday, Saturday, and Sunday for each route, and sample rates are provided as described for Route Ridership Characteristics. The table summarizes the stated results obtained from questions 7 through 10 of the survey, providing passengers' frequency of Metrobus use, tenure of Metrobus use, type of fare payment, the passengers' satisfaction.

Route 33 Transit Use & Passenger Satisfaction

	Weekday	Saturday	Sunday	Daily Average
Passenger Transit Use Characteristics				
Frequency of MetroBus Use				
5 or more days per week	62.6%	71.1%	57.1%	63.1%
3 or 4 days per week	13.1%	8.9%	15.6%	12.9%
1 or 2 days per week	12.6%	11.1%	16.9%	13.0%
Less than once per week	9.2%	4.4%	2.6%	7.6%
Percent Responding	*97.6%*	*95.6%*	*92.2%*	*96.5%*
Tenure of MetroBus Use				
Less than 6 months	16.0%	22.2%	13.0%	16.5%
6 months to 1 year	15.5%	2.2%	10.4%	12.9%
1 to 2 years	18.9%	11.1%	16.9%	17.5%
More than 2 years	45.6%	55.6%	55.8%	48.5%
Percent Responding	*96.1%*	*91.1%*	*96.1%*	*95.4%*
Fare Payment				
Cash	42.7%	46.7%	44.2%	43.5%
Token	3.9%	11.1%	2.6%	4.7%
Monthly Metropass	14.1%	11.1%	10.4%	13.1%
Student Discount	23.3%	4.4%	7.8%	18.4%
Transfer	7.3%	11.1%	19.5%	9.6%
Golden Passport	5.3%	11.1%	13.0%	7.3%
Disability Discount	0.0%	0.0%	0.0%	0.0%
Other	1.5%	2.2%	1.3%	1.5%
Percent Responding	*98.1%*	*97.8%*	*98.7%*	*98.1%*
Passenger Satisfaction				
Cleanliness of Bus				
Excellent	16.0%	28.9%	29.9%	19.8%
Good	41.7%	26.7%	37.7%	39.0%
Fair	28.6%	28.9%	23.4%	27.9%
Poor	5.8%	11.1%	3.9%	6.3%
Percent Responding	*92.2%*	*95.6%*	*94.8%*	*93.1%*
Courtesy of Bus Driver				
Excellent	20.9%	35.6%	46.8%	26.7%
Good	28.6%	28.9%	22.1%	27.7%
Fair	21.4%	2.2%	5.2%	16.3%
Poor	6.8%	8.9%	2.6%	6.5%
Percent Responding	*77.7%*	*75.6%*	*76.6%*	*77.2%*

The information is used as an indicator of the route's penetration into new transportation markets, particularly with respect to tenure of Metrobus use. High frequency of use indicates regular commuting patterns, while low frequency indicates potential transit markets of people willing to use transit, but not yet committed to regular use. The fare payment is important for monitoring the usefulness of the various fare programs, and also may be used to refine average revenue per passenger values that are used to monitor a route's ridership. Passenger satisfaction rates are part of the customer feedback system and tremendously augment MDT's call-in information that is typically biased toward dissatisfaction.

Route Trip Characteristics

The Route Trip Characteristics tables provide information regarding trip pair purpose, trip inter-modal combinations, and MDT system transfers based on the on-board passenger survey. The results from the passenger survey are broken out by weekday, Saturday, and Sunday for each route, and sample rates are provided as described for Route Ridership Characteristics. The table summarizes the stated results obtained from questions 1, 3, 4, and 5 of the survey, providing paired trip purpose frequencies, inter-

modal combination rates, MDT transfer rates, and passengers' attitude toward transferring.

Route 33 Trip Characteristics

	Weekday	Saturday	Sunday	Average Day
Trip Purpose				
Home-Based Destination Trips				
Home-Based Work	20.4%	26.7%	11.7%	20.0%
Home-Based School	30.6%	6.7%	10.4%	24.3%
Home-Based Medical	1.0%	2.2%	0.0%	1.0%
Home-Based Shopping / Errands	4.9%	20.0%	18.2%	8.9%
Home-Based Visiting / Recreation	0.5%	2.2%	3.9%	1.2%
Home-Based Hotel	0.0%	0.0%	0.0%	0.0%
Home-Based Other	6.3%	15.6%	15.6%	9.0%
Home-Based - No Other Answer	3.9%	0.0%	2.6%	3.1%
Sum of All Home-Based Destination Trips Above	67.5%	73.3%	62.3%	67.6%
Occupation-Based (Work) Trip Chain Links				
Work-based Shopping / Errand	1.0%	0.0%	2.6%	1.1%
Work-based School	1.5%	0.0%	0.0%	1.0%
Work-based Medical	0.0%	0.0%	0.0%	0.0%
Work-based Visiting / Recreation	0.0%	0.0%	0.0%	0.0%
Work-based Hotel	0.0%	0.0%	0.0%	0.0%
Work-based Other	1.9%	4.4%	0.0%	2.0%
Work-based - No Other Answer	1.0%	0.0%	2.6%	1.1%
Sum of All Work-based Trips Above	5.3%	4.4%	5.2%	5.2%
Occupation-Based (School) Trip Chain Links				
School-based Shopping / Errand	8.3%	0.0%	0.0%	5.9%
School-based Medical	0.5%	0.0%	0.0%	0.3%
School-based Visiting / Recreation	0.5%	0.0%	0.0%	0.3%
School-based Hotel	1.0%	0.0%	0.0%	0.7%
School-based Other	2.4%	4.4%	0.0%	2.4%
School-based - No Other Answer	1.9%	0.0%	0.0%	1.4%
Sum of All School-based Trips Above	14.6%	4.4%	0.0%	11.0%
All Other Trip Purpose Pairs or Half Pairs	12.1%	17.8%	29.9%	15.5%
Percent Responding at least one answer	*99.5%*	*100.0%*	*97.4%*	*99.3%*

Route 33 Trip Characteristics

	Weekday	Saturday	Sunday	Average Day
Transportation Mode Used To and From Bus and MDT System Transfers				
Intermodal Combinations (to and from)				
Walk 0 to 3 blocks *(approx. 1/4 mile)*	54.9%	52.2%	46.1%	53.2%
Walk More than 3 blocks	18.9%	14.4%	22.7%	18.8%
Kiss-and-Ride (dropped off)	3.2%	3.3%	3.9%	3.3%
Park-and-Ride (drove self)	0.2%	1.1%	0.6%	0.4%
Bicycle	1.0%	3.3%	0.0%	1.2%
Tri-Rail	0.2%	0.0%	0.0%	0.2%
Other	1.9%	3.3%	1.3%	2.0%
MetroDade Transit System Transfers				
MetroRail	1.2%	3.3%	1.9%	1.6%
MetroBus	17.0%	15.6%	20.1%	17.2%
MetroMover	0.0%	0.0%	0.0%	0.0%
Sum of MDT System Transfers	1.5%	3.3%	3.2%	2.0%
Percent Responding	*98.5%*	*96.7%*	*96.8%*	*98.0%*
Number of MDT System Tranfers Reported				
1 Transfer	28.6%	20.0%	35.1%	28.3%
2 Transfers	3.9%	8.9%	5.2%	4.8%
3 Transfers	0.0%	0.0%	0.0%	0.0%
4 or more Transfers	0.0%	0.0%	0.0%	0.0%
Total MDT System Transfers	32.5%	28.9%	40.3%	33.1%
Percent Responding	*see above*	*see above*	*see above*	*see above*
Trnasfer Attitude				
Transfering Does Not Bother Passenger	66.5%	62.2%	72.7%	66.8%
One is Acceptable, But No More	15.5%	17.8%	11.7%	15.3%
Prefer Not to Make Any Transfers	10.2%	4.4%	6.5%	8.8%
Will Not Use Transit If Need to Transfer	2.9%	0.0%	0.0%	2.1%
Percent Responding	*95.1%*	*84.4%*	*90.9%*	*93.0%*

Determining trip purpose pairs is critical to operations planning and as an input to CBOA recommendations. For example, the transit needs of a predominantly home-based work market are very different from the needs of a home-based shopping/errands market. The commuter market requires more emphasis on determining peaks, providing enhanced capacity in the peak periods, and emphasizing speed and on-time performance. The shoppers' market may require more emphasis on convenient access to multiple destinations, possibly at the expense of some speed. Peaks are not as important, and while on time performance is always critical to high quality of service, other characteristics such as convenient stop locations and high levels of amenities at the stops can mitigate schedule reliability issues for a shoppers' market.

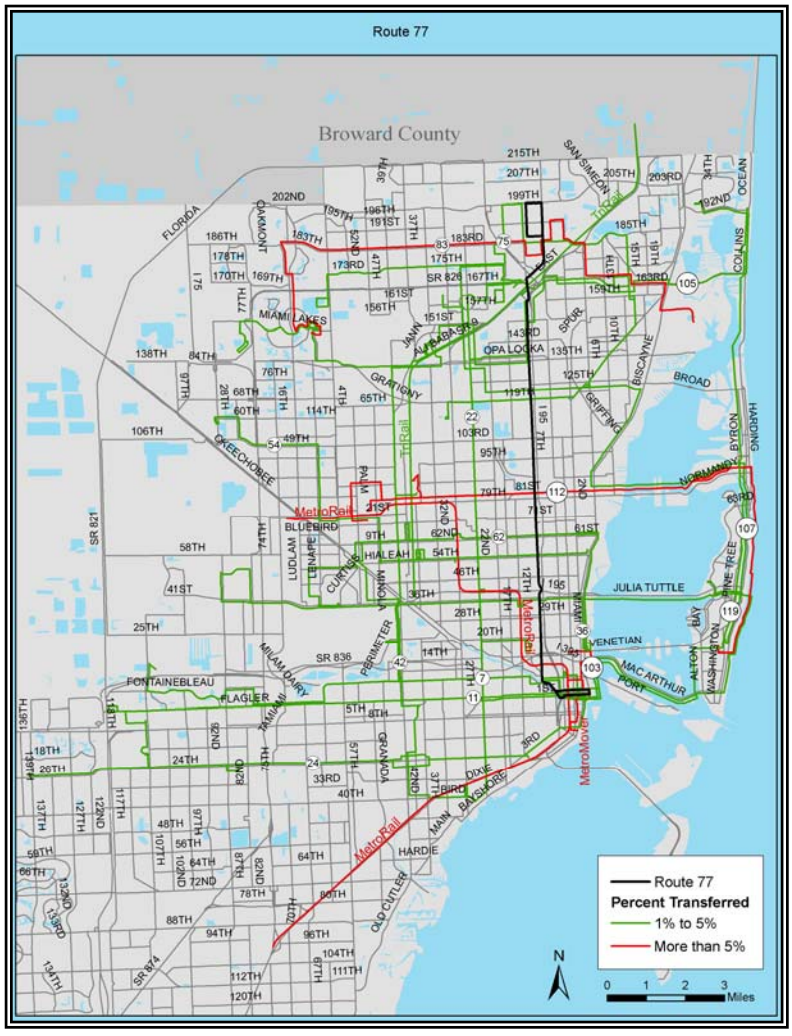
Trip purpose pairs have also been categorized as non-destination trips (not-home based) to indicate the frequency of trips in which trip chaining is evident. These are trips originating from passengers' occupation (work or school) that have a trip end at a shopping, medical, or recreational destination, instead of the final home base. The

importance of identifying these trips is two fold: 1) trip chaining is a growing trend in auto transportation patterns, and requiring flexibility of personal transportation will continue to be a growing impediment to transit use in all but dense urban areas; 2) relatively higher frequency of trip chaining occurrences indicates potentially productive locations for mixed-use transit centers.

Inter-modal trip patterns, including transfers within the MDT system are also very important inputs to planning for alignment changes, including truncations, extensions, and combinations with other route segments. Transfers within the MDT system are also used in conjunction with data collected regarding frequencies of specific route transfers to help indicate a possible need for route segment combination where feasible. Transfer attitude provides valuable information regarding the passengers' willingness to transfer and how many times they are willing to transfer. The summary of transfer attitude responses in conjunction with the number of transfers reported is used as a proxy indicator for passengers' transit use elasticity to service changes.

Route Transfer Analysis Map

The Route Transfer Analysis Map augments the tabular transfer information described in the prior section. It summarizes information regarding the comparative frequency of MDT system transfers based on questions 3 and 4 of the on-board passenger survey that was performed as a part of the CBOA. The map shows the most frequently used transfers from or to a particular route in two categories: 1) transfers used by over 5% of the transferring passengers shown as red lines; and, 2) transfers used by over 1% but less than 5% of the transferring passengers shown as green lines. The subject route of the



analysis is shown as a black line.

Depicting specific transfer frequencies within the MDT system augments the tabular data as important inputs to planning for alignment changes, including truncations, extensions, and combinations with other route segments. For example, two inefficient routes that are still important for meeting unmet community needs may be combined based in large part on consideration of transfer rates, attitudes, and route level transfer frequencies based on this map series. Other factors, including origin – destination analysis are also used.

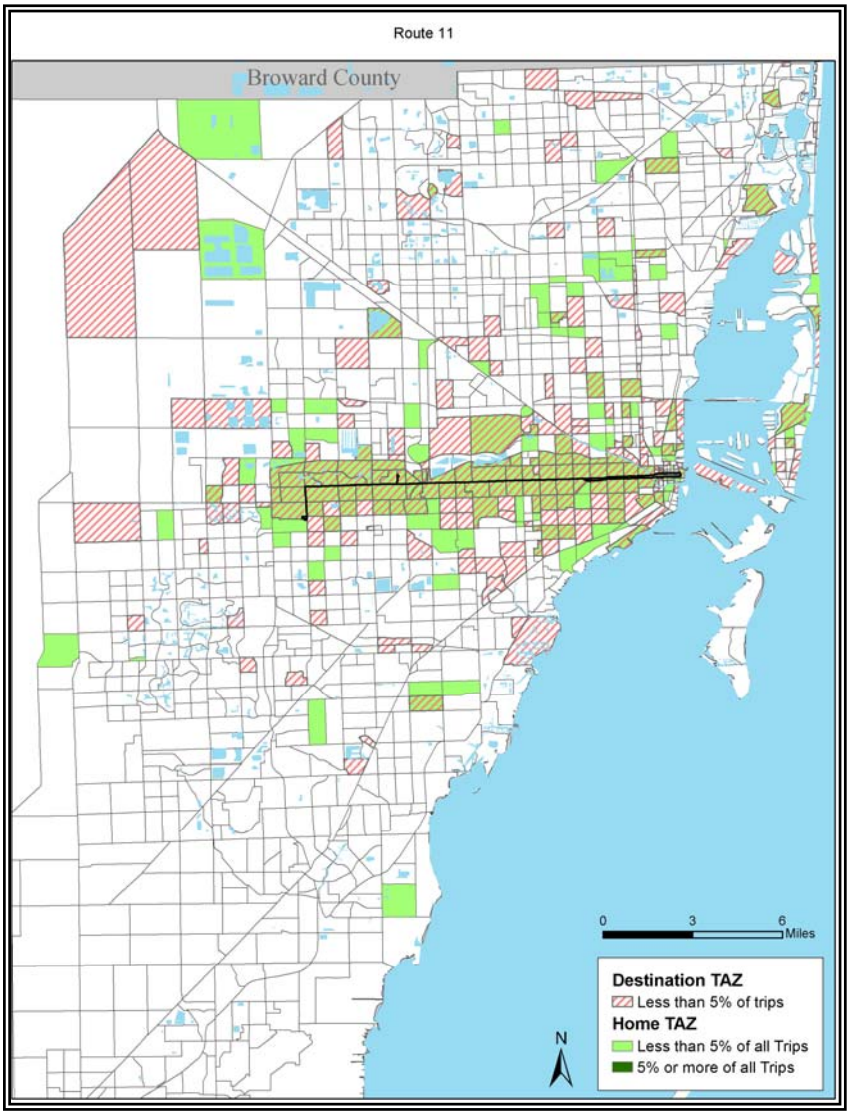
Route Passenger Ridership Origin/Destination Analysis Map

The Route Passenger Ridership Origin/Destination Map provides at a route level, the predominant spatial travel patterns for which the route is used by its passengers. It is based on the open-ended, write-in responses to questions 1, 2, 5 and 6 of the on-board passenger survey that was performed as a part of the CBOA.

For each route, the final trip origins and destination are shown on the relevant portion of the County map. Origins are shaded in dark green, if more than 5% of the passengers begin their trip there, and in light green if between 1% and 5% of the riders begin their trip there. Similarly, destinations are cross-hatched with heavy red lines, if more than 5% of the passengers end their trip there, and cross-hatched with light red lines, if between 1% and 5% of the riders end their trip there.

All passenger origins and destinations are aggregated by transportation analysis zone (TAZ). TAZs typically represent areas on the County's roadway network of about one square mile (smaller in dense areas, and larger in more rural areas), bounded by major roadway arteries and of similar or homogeneous land use patterns.

The on-board survey questions 2 and 6 asked each passenger for the intersection or location where they began and ended their trip, while questions 1 and 5 determined whether the trip was to a destination from home or returning from the destination. The information from both questions was combined to plot the origins and destinations on the map series. The reason for this is that origins and destinations by themselves do not provide a clear understanding of trip patterns, without understanding of the location of home base and the location of the destination (work, school, medical, shopping, recreation, visiting, hotel). Therefore, for this map series, green signifies the TAZ in which the passenger's home base is located, while the red cross-hatched TAZ signifies



the destination. This provides a much more clear understanding of AM and PM peak travel patterns.

Interpretation of the origin/destination analysis is important as input to planning for alignment changes, including truncations, extensions, and combinations with other route segments. Origin/destination patterns with strong clustering along the alignment indicate a route that provides the spatial connection that its passengers need. Origin/destination patterns with wide-spread variations and less consistent clustering along the alignment may need some alignment changes, depending on other factors. Origin/destination patterns with strong clustering at the ends of the route in a dog bone shape may indicate the need for different type of service such as a MAX, which is a limited stop service. If one end of the dog bone is beyond the alignment, an alignment extension may be explored, while if the one end of the dog bone is before the alignment ends, a truncation may be explored, either with consideration of other factors. Notably, strong visual correlations between the shape of origin/destination patterns, and the number and direction of transfers depicted on the Route Transfer Analysis Map are often apparent.

Route Segment, Boarding, Debarking, Load, and Productivity Analysis

The Route Segment Boarding, Debarking, and Productivity Analysis tables are one of the most important foundations of the basis of many of the service recommendations.

These tables are based on boarding and debarking observations of the ride-check survey's 1,017,620 data records (2,035,240 data points).

For each route and direction, a table is provided for each of the time periods of analysis: AM Peak, Midday, PM Peak, Night, Saturday Day, Saturday Night, Sunday Day, and Sunday Night. For each route, sixteen tables are provided, eight for each direction. Each table is comprised of 16 columns. The third and fourth columns list the beginning and endpoints for each segment in each direction. The second column shows the number of sample trips input into the data summary. After the segment end points, columns show the number of boardings and debarkings in the segment. These values are the sum of all of the stops in the segment, and represent an average of these sums as observed over the multiple sample trips for the segment and time period indicated in the second column. Following boardings and debarkings, passenger activity is calculated as the sum of passengers on and off. Passenger activity provides a more balanced representation of segment productivity for a time period.

Segment maximum and average loads are calculated as the accumulation of passengers on the bus through the segment. The maximum is not a single instance maximum, but the average of maximum loads in the segment over all of the sample trip observations. Segment average and maximum loads are also provided as a percent of bus seated capacity with inputs as to the type of bus from survey records.

The last four columns provide segment productivity measures, using: boardings per mile, boardings per revenue hour, passenger activity (ons + offs) per mile, and passenger activity per hour.

The schedule recommendations are based on the ride-check survey's data records from observations taken by surveyors on buses. Approximately 10% of the stops are time points; therefore, the basis of this analysis is in the range of 100,000 observations in which actual time-point arrivals and departures were recorded. Subsequent analysis determined actual segment travel time between time-points, and then averaged the multiple observations for each segment and each time period. Segment travel time, rather than time-point schedule deviation is used to negate any effects of cumulative early or late arrivals.

As segment productivity is a key criteria of analysis in the CBOA, these tables were directly used in developing recommendations for service improvements and system efficiency improvements.

Summary of Bus Operator Route Ratings, Problems, and Passenger Complaints

As part of the CBOA, bus operators in all divisions were surveyed to receive their assistance in pinpointing deficiencies in the system. When surveyed, they were asked questions regarding scheduling, restroom facilities, overcrowding, and passenger complaints on their regular routes and occasional routes. The results of the survey are summarized by route on this page in the appendices. In addition, an overall rating for the routes operational difficulty was queried, and the response is averaged here and compared to the average for all of the routes in the system.

These results are used to augment other data, particularly the results of the ride-check survey for which the operators survey results may corroborate schedule deficiencies, and segments with loading problems. In addition, their recollections of passenger complaints provide additional input for passenger satisfaction, especially from passengers that do not call MDT Customer Service.

Summary of Bus Operator Observations

The Summary of Bus Operator Observations is the detail of the bus operator survey, and the page provides the operators response to the occurrence of scheduling problems, overcrowding problems, and the presence of inadequate bus stop equipment or maintenance by route segment. As with the prior section, these results are used to augment other data, particularly the results of the ride-check survey for which the operators survey results may corroborate schedule deficiencies, and segments with loading problems.

SERVICE RECOMMENDATIONS

This section summarizes the service recommendations provided by the CBOA. There are four parts to this section. A short analysis synopsis briefly describes the process and inputs by which the recommendations were developed. The types of recommendations are then described, along with a description of service improvement and system efficiency results that can be expected from different recommendations. Lastly, a table is provided that summarizes the recommendations detailed in the appendices. The table allows all of the recommendations to be considered together. In addition, cumulative impacts are determined.

Analysis Synopsis

Described below is a brief summary of the inputs to analysis for developing the service recommendations. Most of the criteria areas below are analyzed in conjunction with other area, and these relationships are noted. These inputs are also discussed in greater detail in the *Route Profiles, Data, and Analysis* section.

1. Duplication - The route's alignment and service characteristics were compared to others along a similar corridor to determine whether there was duplicative service that could be consolidated into one of the routes.

2. Purpose - The route's alignment, service area, schedule, name, and passenger characteristics were considered to determine the purpose of the route (ie. commuter, express, local circulator, etc.), and then alignment segments, particularly branches, were examined for consistency with that purpose. If a segment was inconsistent with the route's market, and if the service diminished the core service of the route, then branch service by another route was considered.

3. Travel Patterns - Origin/destination, trip purpose, and transfer results were considered as part of the route purpose and segment consistency analysis of #2.

4. Productivity - Productivity was considered to identify inefficient routes and segments as candidates for service changes, in terms of: passengers per hour to consider overall utilization of service;

passengers per seat revenue hour to consider appropriateness of assigned bus size; direct operating recovery ratio to determine resource utilization effectiveness; and net cost per passenger trip to determine system cost impact of service changes.

5. Schedules - Schedules and schedule adherence were considered in conjunction with calculated loads and input from the operators' survey to identify problem areas for: delay; poor productivity due to slow travel speeds exacerbating low passenger activity; poor service due to increased trip times; increased time at high load factors that significantly decrease passenger comfort; and "lumpy" or inconsistent loads from bus to bus due to bunching and "leap-frogging" with both problems caused by inadequate scheduling.

6. Route Length - Route length was considered for two reasons: 1) short routes are good candidates for combination with others, if the service is inefficient or a combination can enhance the quality of service; 2) very long routes often have schedule problems if recovery locations are not distributed well along the route. This is often the case, and scheduling problems can be addressed by truncations and recombination of the truncated route into another service. Other factors, such as origin/destination patterns and transfer patterns were considered in these cases.

7. Land use - Corridor land use analysis was used in combination with segment productivity analysis, as well as consideration of the bus equipment used. Typically, alignments that include long segments over single-family residential areas have sharply decreased productivity over those segments. In addition, full size buses were often intrusive to the environment in these areas.

8. Service Span - Service span was considered along with passenger activity data to determine if a longer span was needed or if early or late trip(s) were underutilized. Typically, if the first or last

trip has 50% or more of the next one, another trip should be considered for addition.

9. History - All of the above analysis was based on numerical values and criteria for efficiency and service. Considerable flexibility was allowed with any one criterion, so that the sum of all analysis weighed in on developing service change recommendations. In addition to numerical criteria, qualitative criteria were considered, such as: the severity of a community's need, even if service was provided inefficiently; historical reasons for a service or segment that may not be discernable in the data, or that was changed; and service changes that were tried before, but were not effective for otherwise unforeseen reasons. These types of criteria were best identified through the invaluable and extensive institutional knowledge of MDT's service planning staff. The CUTR Team held a workshop over two full days with MDT Service Planning staff to review the initial draft recommendations along with the analysis and data. The final recommendations have taken into account all of the qualitative information that is appropriate to each route and recommendation.

Through the analysis and review of results to develop practical and meaningful recommendations, the CUTR team adhered to a number of principals that guided the direction of recommendations:

- Connect communities to cure routes do not perform well because their service area is limited and they have very few destinations, as well as provide faster regional connections among geographically spread-out origins and destinations in the County.

- Coordinate services so that as many passengers as possible benefit from well-timed transfers at convenient locations with amenities for waiting passengers.

- Meet specific and expanding market needs for youth, seniors, and "non-traditional work-hours passengers" with school destinations, community circulators, later service, and increased weekend service levels.

- Focus on major trip generators, such as shopping centers, schools, medical facilities, universities, and senior centers as destinations and transfer points.

- Allocate resources where they are most needed and will be most used.

- Minimize vehicle requirements, especially peak vehicle needs to generate tangible savings toward achieving the goal of efficient transit service

- Keep it simple. Establish a logical route structure and family of services. To the extent possible, standardize headways at clock-face intervals (so that buses arrive at stops at the same time each hour) and provide consistent spans of service.

The People's Transportation Plan was used as the basic structure of future services in Miami-Dade County. Recommendations were developed to supplement and reinforce already planned improvements. In a few cases, the data suggested adjustments to some components of the PTP, and those have been identified in the recommendations. The recommendations in this study include cost savings or increases associated with implementation, but to avoid double counting, the costs of PTP recommendations are not included.

Types of Recommendations

The CBOA includes recommendations for increasing system efficiency, improving service to the County's transit customers, and providing better service and to attract new ridership. The types of recommendations are described, along with a description of service improvement and system efficiency results that can be expected from different recommendations.

Schedules - Schedule enhancements were provided in April and August of 2004 with the singular purpose to improve reliability. By comparing observed running times to scheduled running times, recommendations for adding or subtracting time at each time point were made. By improving on-time reliability, quality of service and customer satisfaction are both enhanced. To some extent, efficiency is increased; however, if time contractions do not have a cumulative effect to reduce a pullout (bus), then no savings are realized. In many cases, the sum of recommendations adds time to trips, and additional equipment required for those will

mitigate any savings elsewhere. System efficiency is improved; however, surplus equipment is not realized to utilize for new or enhanced services with these recommendations.

Headways - On routes where certain time periods have high loads for extended consecutive segments, headway improvements are recommended. Conversely, on routes where certain time periods have very low loads over the entire alignment, headway expansions (service contraction) are recommended.

Alignment Changes - Various combinations of productivity, trip pattern, transfer pattern, and land use analysis compel one of three types of alignment changes: 1) re-combination of a segment from one route to another; 2) route extension to cover new areas of need; 3) route truncation to remove unproductive segments from areas without any transit market, or from areas that are served by another route that can provide similar connectivity.

Service Deletion – A compelling combination of low productivity and trip patterns that can be met by other transit services result in recommendations to delete a route entirely or during certain times (service span contraction). In most cases, a complementary recommendation provides service by another route.

New Service - In cases where there is a fully unmet market need, a new service is recommended, such as a new MAX or new circulator service.

Route Combination - Various combinations of productivity, trip pattern, transfer pattern, and land use analysis, among two routes with alignments that meet and markets that are complementary are recommended for combination. The new service is thought to provide enhanced mobility for each of the routes' passengers, attract a new transit market, or produce bus equipment savings.

Results

There are two kinds of results that come from the service recommendations:

1) Enhanced service is realized at a route and system level through increased coverage, faster and more reliable service, enhanced connectivity, fewer transfers, increased service span, or increased frequency (reduced headway).

2) System efficiency is realized through the enhanced service in combination with equipment savings from contraction and reallocation of unproductive services. Like all government services using limited resources all needs cannot be met at an individual level. Decisions must be made to move resources to more productive use and, in doing so, the benefit to the County is increased overall. It is important to understand that for every increment of capacity that is used unproductively, there is a significant opportunity cost that is weighed by that capacity not being used for a more productive and greater need. With this in mind, the CUTR Team has considered the factors outside of benefit/cost considerations, and to the extent that they are known, addressed community needs that may be small but important. All reallocations of service and equipment are intended to maximize the benefit to the County for every dollar spent on bus transit operations.

Route Service Recommendations Tables

The Route Service Recommendations Tables that follow summarize the route-by-route recommendations and their impacts. Each route is listed by number, letter, and name. The recommendation is briefly stated, along with the impacts in terms of quality of service and equipment utilization.

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
1	South Dade Corridor	No action recommended at present.	No impact	no impact
2	Regular	Remove Horace Mann Middle School deviation from long trips, and provide service only during school bell times by extending short trip.	Faster service for through passengers	no impact
3	Regular	Eliminate Country Club loop route deviation and replace service with Route E. This will be an end of route addition for E, while loop is midroute for 3.	Passengers using Country Club loop may require an additional transfer. Through passengers will have higher quality of service, from shorter travel time.	less 1 bus and 4727 hours: $234,506 saving
6	Regular	Discontinue single trip to NW 11th St.& NW 19th Av.	Impacts passengers who take route from north side of alignment, through downtown, to the south side.	less 2 bus and 3820 hours: $257,506 saving
New Service: 6N and 6S	Circulator	Replace Route 6 with 2 smaller circulators.	See 6 above	no impact
7	Regular	When Route 11 short trips are extended to the Dolphin Mall, truncate Dolphin Mall branch of Route 7 at Mall of the Americas.	Passengers using Route 7 to Dolphin Mall may require an additional transfer.	less 1 bus and 1055 hours: $57,160 saving
8	Regular	No action recommended at present. When extended to SW 137 Av. in 2005 per PTP, locate turnaround. If none, extend to bus terminal park & ride at SW 8 St and SW 127 Av.	No impact	no impact
9	Regular	No action recommended at present. Monitor performance north of NW 125 St. to consider swapping alignment with Route 16.	No impact	no impact
10	Regular	Improve peak headways from 40 to 30 minutes. Can be accomplished without extra bus.	Improved quality of service in peaks: shorter total travel time, wait time, and lower peak loads (crowding)	add 0 bus and 1445 hours: $101,010 cost
11	Regular	Actions per PTP to extend short trips to the Dolphin Mall. See complementary recommendation to Route 7.	No impact	no impact

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
12	Regular	Streamline along NW 12 Av from NW 62 to NW 67 Streets.	Passengers using deviation will have additional walk distance. Through passengers will have higher quality of service, from shorter travel time.	no impact
12	Regular	Streamline along NW 12 Av in Civic Center area, and establish Civic Center Circulator.	Improved quality of service for passengers not using Civic Center stops. Additional transfer for Civic Center passengers.	less 1 bus and 3060 hours: $216,740 saving
New Service: Civic Center Circulator	Circulator	Establish Civic Center Circulator every 15 min weekdays, and 30 min weekends. See detailed recommendations for Route 12 for recommended alignment and service spans.	Improved quality of service for Civic Center transit customers. May induce new ridership.	add 2 bus and 10395 hours: $675,675 cost
16	Regular	No action recommended at present. Monitor performance north of NW 125 St. to consider swapping alignment with Route 9.	No impact	no impact
17	Regular	Short turn alternate buses at 95th Street during the mid-day period.	Results in 60 minute headways north of 95th Street.	less 0 bus and 1258 hours: $87,373 saving
21	Regular	Truncate all trips at Northside Station.	Passengers continuing north must transfer to Routes 17, 22, or 27.	less 1 bus and 4133 hours: $281,912 saving
22	Regular	No action recommended at present. (PTP improves headway from 20 to 15 minutes, and 40 to 30 minutes on the Coconut Grove and Civic Center Branches.)	No impact	no impact
24	Regular	Reduce weekday headways from 15 to 20 minutes.	All passengers will experience higher average wait times, and higher loads. No crowding is expected.	less 3 bus and 7761 hours: $519,909 saving
27	Regular	Add southbound trips via the NW 27 Avenue branch at 10:35 and 11:35 pm on weekdays and Saturday. (also adds northbound return service)	Added trips accommodate Pro Player Stadium events.	add 0 bus and 1212 hours: $85,116 cost
28	Regular	No action recommended at present.	No impact	no impact

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
29	Regular	Turn over this route to the private sector as part of the Jitney Pilot Project.	Low ridership and productivity service to be provided by private sector.	less 5 bus and 13035 hours: $446,058 saving
Busway Local (31, 231)	South Dade Corridor	With introduction of Busway Flyer (Route 34) in November 2004. When Busway extension is complete, combine Busway Local and Busway Max (38) into a single route. (see also Route 38)	No impact	no impact
32	Regular	Streamline turnaround loop at northern terminus via NW 191 Street, NW 42 Av., NW 201 St., and NW 43 Av., matching Route 99 turnaround.	Service to Florida Memorial College is via the North Dade Connector. Route 32 still serves St. Thomas College.	no impact
33	Regular	Reroute NE 10th Avenue segment via NE 96 St, NE 6 Av., Biscayne Blvd., NE 79 St., and NE 5 Av. to route's current layover.	NE 10th Avenue service to be provided by expanded Little Haiti Circulator service.	less 1 bus and 1743 hours: $125,723 saving
35	South Dade Corridor	No action recommended at present.	No impact	no impact
36	Regular	Extend the Miami Springs branch via Curtiss Parkway and Okeechobee Road to the Hialeah Triangle to use the same layover location as Route 62.	No impact	no impact
37	Regular	No action recommended at present. When the MIC is complete, should be considered for breaking into two routes.	No impact	no impact
Busway Max (38)	South Dade Corridor	With introduction of Busway Flyer (Route 34) in November 2004. When Busway extension is complete, combine Busway Local and Busway Max (38) into a single route. (see also Route 31)	No impact	no impact
40	Regular	No action recommended at present. After completion of new bus terminal and extension of Route 8, restructure University Lakes Trailer Park Branch. (see detailed recommendations)	No impact	no impact
42	Regular	No action recommended at present. (see detailed recommendations options)	No impact	no impact

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
48	Regular	Reroute the 48 via the current Route 6 alignment to the CBD and truncate there. Northern segment to be discontinued due to low utilization. (see Rt. 6)	Northern segment passengers may be underserved.	less 1 bus and 2091 hours: $130,541 saving
Flagler Max (51)	Express / Limited	Move western terminus to the new West Dade Terminal. (truncation)	Passengers using stops further west than the West Dade Terminal may be underserved.	less 1 bus and 4225 hours: $290,807 saving
52	South Dade Corridor	Discontinue peak period service to SW 122 Avenue between SW 216 and SW 220 Streets.	The new Goulds Connector route will serve this area.	less 0 bus and 89 hours: $6,055 saving
54	Regular	No action recommended at present.	No impact	no impact
56	South Dade Corridor	Operate route with small buses	Higher loadings will be experienced.	no impact
57	Regular	Route 57 will extend to MIA per PTP. Combine Routes 57 and 65, with each along its current route to SW 77 Av & SW 136 St, after which they are combined. (see Route 65)	Columbia Deering Hospital not served. Passenger activity in this segment is low, and other routes provide service	no impact
62	Regular	No action recommended at present.	No impact	no impact
65 Express	South Dade Corridor	Route 57 will extend to MIA per PTP. Combine Routes 57 and 65, with each along its current route to SW 77 Av & SW 136 St, after which they are combined. (see Route 57)	Columbia Deering Hospital not served. Passenger activity in this segment is low, and other routes provide service	no impact
70	South Dade Corridor	No action recommended at present.	No impact	no impact
71	Weekday / Weekend	Swap Route 71 with the West Dade Connection between Flagler and NW 7 St. Route 71 stays on 107 Av. and West Dade Connection travels along NW 112 Av. and NW 7 St.	Additional potential transfer of passengers.	less 1 bus and 973 hours: $65,103 saving

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
72	Regular	Truncate at South Miami Station on weekdays, in conjunction with extension of Route 57 to MIA.	Passengers using stops further than South Miami Station may require an additional transfer.	less 3 bus and 10051 hours: $689,901 saving
73	Regular	Discontinue short turn at Miami Childrens Hospital.	Low ridership, low productivity segment truncation will displace some passengers; however, additional frequency is gained in rest of alignment.	no impact
75	Regular	1. Reroute along NW 57 Av. NW 186 St., and NW 52 St. to serve Super Wal-Mart. 2. Operate with small buses on weekends.	Destination desired by community will be served by the route.	no impact
77	Regular	Truncate every other trip at Golden Glades and operate long trips via the evening turnaround.	Reduced frequency to a small component of route's ridership that goes to or from north of Golden Glades.	less 1 bus and 4522 hours: $303,878 saving
83	Regular	No action recommended at present.	No impact	no impact
87	Regular	Reroute along NW 87 Av. Between NW 12 and NW 25 St.	Realignment will serve Target and reduce travel time for through passengers.	no impact
88	Regular	No action recommended at present.	No impact	no impact
91	Regular	No action recommended at present.	No impact	no impact
Biscayne Max (93)	Express / Limited	Stagger departure times from downtown on Routes 3 and 93 during peak periods.	Reduced wait time for passengers that can use MAX or 3.	no impact
95 Express (95)	Express / Limited	Reroute Aventura Mall trips via Ives Dairy Road or Miami Garden Drive.	Minimal impacts	no impact

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
27 Max (97)	Express / Limited	No action recommended at present.	No impact	no impact
99	Regular	No action recommended at present.	No impact	no impact
A (101)	Regular	Combine Route A and W with 15-minute headways during peaks (7-9am and 3 to 5:30 pm), and 20-minute headways at other times. (see Route W)	MDT's Route W is replacing the City of Miami Beach Electrowave. Route A&W would enhance mobility to Omni, Metro Mover, Miami CBD, and connect two Arts Districts.	add 0 bus and 1964 hours: $137,702 cost
B (102)	Regular	Improve headway to 10 minutes during AM peak to accommodate southbound loads. Operate additional trips via the Crandon branch.	Improved quality of service through reduced wait time, reduced trip time, and reduced peak loads.	add 1 bus and 297 hours: $25,809 cost
C (103)	Regular	Improve headways on Sunday from 30 minutes to 20 minutes. Operate existing Saturday schedule on Sunday.	Improved quality of service through reduced wait time, reduced trip time, and reduced peak loads.	add 3 bus and 2620 hours: $158,248 cost
104	Regular	No action recommended at present.	No impact	no impact
E (105)	Weekday / Weekend	Streamline via NW 163 St. and use Route V to serve Summerwind Apartments and NW 151 St. employment area. Add Country Club loop from Route 3. Add one late trip on Saturday and Sunday evenings from Aventura Mall to Golden Glades.	Potential additional transfer for Summerwind Apartments and 151 St. area passengers. Enhanced mobility to Aventura loop, and improved service via increased service span.	add 1 bus and 1803 hours: $125,146 cost
G (107)	Regular	No action recommended at present.	No impact	no impact
H (108)	Regular	November line-up shifts alignment from 3rd St. to 5th St. in Miami Beach. Consider earlier implementation of 2006 PTP headway improvement to 15 minutes in peaks. No action recommended at present.	No impact	no impact

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
J (110)	Regular	No action recommended at present. In future consider branch south of 41 St. in Miami Beach to link this area to the Airport.	No impact	no impact
K (111)	Regular	Work with Gulfstream Park to use as a layover for Route K.	Minimal	no impact
L (112)	Regular	PTP improves headway to 7.5 minutes in 2005. MDT is considering implementing a 79th St. MAX. No other recommendations at present.	No impact	no impact
M (113)	Regular	Delete South Beach segment of Route, and turn left on Alton from 5th St. Truncate in Civic Center Area. New Civic Center circulator is to be added in conjunction. (see Route 12 and Civic Center Circulator)	Potential additional transfer for South Beach and Civic Center passengers.	less 1 bus and 4131 hours: $270,415 saving
R (118)	Regular	No action recommended at present.	No impact	no impact
S (119)	Regular	No action recommended at present.	No impact	no impact
T (120)	Regular	MDT is planning to use reposition Route T as the Beach MAX. No other recommendations at present.	Minor impact to passengers of stops that are not served by limited MAX express service. Potential additional transfer for these passengers. Enhanced service via lower travel time for all others.	no impact
V (122)	Regular	No action recommended at present. Route V will be providing only service to areas where Route E has been streamlined.	Expect higher loads from restructuring of Route E. No overcrowding expected.	no impact
W (123)	Regular	Combine Route A and W with 15-minute headways during peaks (7-9am and 3 to 5:30 pm), and 20-minute headways at other times. (see Route A)	MDT's Route W is replacing the City of Miami Beach Electrowave. Route A&W would enhance mobility to Omni, Metro Mover, Miami CBD, and connect two Arts Districts.	no impact

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
Tri-Rail, Koger Shuttle (132)	Express / Limited	Market this route jointly with Tri-Rail and Doral Center. If ridership does not improve within six months, discontinue the route.	No impact	no impact
Tri-Rail, Airport Shuttle (133)	Express / Limited	No action recommended at present.	No impact	no impact
West Dade Connection (137)	Shuttle / Connector	Swap Route 71 with the West Dade Connection between Flagler and NW 7 St. Route 71 stays on 107 Av. and West Dade Connection travels along NW 112 Av. And NW 7 St.	Additional potential transfer of passengers.	no impact
Gables Connection (152)	Shuttle / Connector	Change midday frequency form 30 to 60 minutes due to low ridership and productivity.	Reduced frequency and quality of service to midday passengers.	less 0 bus and 4045 hours: $251,607 saving
Little Haiti Connection (202)	Shuttle / Connector	Add a weekdays-only one-way loop (NE 79 St., NE 10 Av., NE 96 St., Biscayne Blvd.) to serve displaced service area along NE 10th Avenue from realigned Route 33.	Additional local mobility via community circulator.	add 0 bus and 501 hours: $34,922 cost
Killian Kat (204)	Express / Limited	Discontinue weekend service	Will displace 297 Saturday passengers and 184 Sunday passengers. Coverage and mobility still available from other routes.	less 0 bus and 3740 hours: $329,349 saving
Little Havana Circulator (208)	Circulator	MDT is renaming Route 207/208 in Nov. 2004 to clarify clockwise and counter-clockwise service areas. No other recommendations at present.	No impact	no impact
Sweetwater Circulator (212)	Circulator	Continue to monitor route. If ridership and productivity do not increase, reduce headways to operate with 1 bus, or combine with new Route 147.	No current impact	no impact
Coral Way Max (224)	Express / Limited	Reduce the number of stops on the MAX to encourage additional express ridership.	Minor impact to passengers of stops that are not served by limited MAX express service. Potential additional transfer for these passengers. Enhanced service via lower travel time for all others.	no impact
East-West Connection (238)	Shuttle / Connector	No action recommended at present.	No impact	no impact

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
Bird Road Max (240)	Express / Limited	Discontinue midday service. Last morning trip at 7:50 am WB and 8:35 am EB. First afternoon trip at 3:10 pm WB, and 3:56 pm EB.	Will displace off-peak MAX passengers. Coverage and mobility still available from other routes.	less 0 bus and 3715 hours: $293,065 saving
North Dade Connection (241)	Shuttle / Connector	Discontinue last two evening trips, with last EB trip at 7:00 pm, and last WB trip at 6:50 pm. Market route more to served communities, and if ridership does not improve within 6 months, discontinue.	Will displace small number of passengers. Total average daily ridership is 300. Coverage and mobility still available from other routes.	less 0 bus and 1020 hours: $73,324 saving
Doral Connection (242)	Shuttle / Connector	Route is to be realigned in Nov. 2004 to serve FDOT office at NW 122 Av. No additional changes recommended for this route.	Enhanced service area with additional employment destination.	no impact
Seaport Connection (243)	Shuttle / Connector	Discontinue midday service. Market route more and, if ridership does not improve within 6 months, discontinue.	Will displace small number of passengers. Total average daily ridership is 164. Coverage and mobility still available from other routes.	less 0 bus and 3396 hours: $246,646 saving
Okeechobee Connection (245)	Shuttle / Connector	Discontinue service.	Will displace small number of passengers. Total average daily ridership is 425. Coverage and mobility still available from other routes.	less 2 bus and 7021 hours: $511,690 saving
Brickell Key Shuttle (248)	Shuttle / Connector	Discontinue midday (9:00 am to 3:00 pm) and all Saturday service.	Will displace small number of passengers. Total average daily ridership is 419. Coverage and mobility still available from other routes.	less 0 bus and 3632 hours: $390,257 saving
Coconut Grove Circulator (249)	Circulator	Increase revenue by collecting fare on this route. No service changes recommended at present.	Cost impact to passengers.	no impact
Coral Reef Max (252)	South Dade Corridor	Operate weekday long trips to and from SW 162 Av. directly via SW 152 St., operating non-stop from SW 152 Av. To SW 137 Av. Weekend long trips continue to serve Country Walk loop.	Minimal impacts	no impact
Ludlum Max (267)	Express / Limited	No action recommended at present.	No impact	no impact

Route	Service Type	Recommendation	Service Impacts	Resource Impacts
Sunset Kat (272)	Express / Limited	No action recommended at present.	No impact	no impact
Flagami Connection (278)	Shuttle / Connector	Market route more , and if ridership does not improve within 6 months, discontinue, and implement lifeline service along SW 57 Av., Pan American Hospital, and Mall of the Americas.	No current impact. Total average daily ridership is 91. Coverage and mobility still available from other routes.	no impact
Saga Bay Max (287)	South Dade Corridor	No action recommended at present.	No impact	no impact
Kendall Kat (288)	Express / Limited	No action recommended at present.	No impact	no impact

ON-GOING MONITORING RECOMMENDATIONS

The CBOA has comprehensively considered current and planned operations to develop recommendations; however, an on-going effort is needed to continue to monitor improvements and provide the information to further change service to ever evolving community needs. The monitoring must balance information needs with the costs to obtain such information and achieve a more timely process for collecting and using information so that planning and service changes may be incremental and on-going. This will also help to avoid large single-year costs for studies of the breadth and scope of the CBOA.

With the exception of scheduling, most of the new data collected during the CBOA will be useful for a planning horizon of about 5 years. As the information becomes more obsolete with each passing year in a dynamic community as Miami-Dade County, by the fifth year much of this new data would be unreliable for detailed planning purposes. Going forward from this point, four components of a monitoring system need to be put into place.

Scheduling

Updating schedules to maintain service reliability, incrementally improve equipment utilization, and provide a high customer satisfaction to induce new ridership requires up-to-date on-time performance data. MDT reschedules three times per year, and while the CBOA's data set is very comprehensive, it unfortunately is the most perishable data in terms of its usefulness over time. The data's short life is exacerbated by two other conditions, 1) schedule changes should be made conservatively and gradually over several line-ups so that the disruption to existing ridership is minimized, and 2) in a highly congested and rapidly expanding and redeveloping area as Miami-Dade County, scheduling is continuously challenged by construction delays, detours, and rapidly increasing and variable traffic congestion patterns.

The fact that schedule data are so perishable is compounded by that reality that this is the most expensive data collection effort of all of those the CBOA undertook. Scheduling, as well as boarding and debarking data (see below) were collected by a manual process called a ride check. At the sample levels used (80% for weekdays, 75% on Saturdays, and 50% on Sundays for each route), 11,750 surveyed trips and over 15,000 survey hours were required to collect over 1-million stop and time point records. Including analysis, the cost of this survey was approximately $700,000 of the CBOA

costs, which translates into about $800 per average daily system pullout (876), or $112 per average system one-way trip.

MDT currently runs an automatic vehicle locator (AVL) system in its fleet; however, because the system polls at 2 minute intervals and has some coverage "holes," the AVL system has not been able to be used effectively by MDT operations planning and scheduling staff.

In order for MDT to monitor activities beyond the CBOA, Automatic Passenger Counters (APCs) should be be used to monitor schedule adherence and ridership. While minimum requirements could use sampling with about 10% of the fleet, having APCs for the whole system provides a richer and more comprehensive data set that can be used to analyze, plan, and make well-informed operations planning decisions. Progressive transit agencies such as Tri-Met in Portland, Oregon use approximately 72% APCs on their fleet, and are including APC specs in all new buses toward a goal of a 100% APC-equipped fleet.

MDT is pursuing the goal of 100% APC-equipped buses. In order to have check and balances and to ensure that the APC system is working properly and the data captured are accurate, another system needs to be in place. CUTR has reviewed the Trapeze Plan software and recommended that a pilot be conducted to assess its capabilities. This system is a module of the existing Trapeze software used by MDT and allows for data collection using Personal Digital Assistants (PDAs).

Recommendation 1: For on-going scheduling monitoring purposes, periodic system-wide ride check surveying should be replaced with daily data flow from an Automatic Passenger Counter (APC) system. The system should be implemented within 3 to 5 years to avoid CBOA-level ride check survey.

Recommendation 2: Implement a pilot program to assess and verify the capabilities of APCs, by using a separate system that uses the existing scheduling software (Trapeze) and data collection using PDAs.

Recommendation 3: In addition to schedule monitoring through the APC system, a formal feedback loop with the operators should be established regarding schedule problems on their routes. Periodic surveys, or other means may be appropriate.

Route Capacity

Planning bus route capacity (vehicle size and frequency) to meet increasing loads at a route and segment is also necessary to maintain and improve quality of service as well as improve the efficiency of equipment utilization. Capacity planning requires up-to-date boarding and debarking at a stop level by route, time-of-day, day-of-week. MDT collects ridership data monthly for its Section 15 reporting; however, this data, aggregated by trip, cannot provide segment activity or load levels. In addition, the system depends on coordinating manual count activation by the driver and fare box revenue and is vulnerable to operator error.

Similar to the scheduling data, collection is very expensive, and the data are perishable in that usefulness for planning purposes will not last through the planning horizon of the People's Transportation Plan (PTP). New data will need to be available to continue with monitoring and operations planning. As for scheduling data, an automated system is preferable for budgeting, staffing, quality of data, and timeliness of data.

> **Recommendation 4: For on-going capacity monitoring purposes, periodic system-wide passenger on and off counts should utilize an Automatic Passenger Counter (APC) system.**

As discussed above, MDT has committed to procuring an automatic passenger counter (APC) system for installation on 100% of its fleet over the next 5 years. The APC system will provide daily information regarding time into and out-of time points, as well as boarding and debarking counts at every stop.

Alignment Planning

Review of the utility of current route alignments was a major focus of the CBOA. While looking at the system all at one time is advantageous for balancing the impacts of changes across routes, it is also true that implementing these changes is best done gradually to minimize disruptions to current transit passengers. With this in mind, alignment planning and data collection should be done at shorter intervals, allowing more incremental and smaller changes to achieve the same effect.

Alignment planning, for the most part, depends on four bodies of data: 1) boarding and debarking at a stop and segment level; 2) transfer analysis; 3) route-level passenger origin/destination and trip purpose data; and 4) land use analysis of the alignment.

The boarding and debarking data needs will be more than adequately met by the APC system as it comes on line. Land use analysis is based on the Miami-Dade County Comprehensive Development Master Plan (CDMP) data that is amended at five-year intervals (not including biannual and small-scale land use amendments). The process to collect passenger origins and destinations, trip purpose, multi-modal connections, and MDT transfer data, can only be performed by an on-board passenger survey. Balancing the dual needs for providing timely data and controlling planning costs, and considering that the CDMP (including its transportation element and transit sub-element) is based on a 5-year horizon, a 5 year interval for collecting trip characteristics is appropriate.

Recommendation 5: System-wide alignment planning should be scheduled for a five-year interval and be scheduled to use updated analysis data for the County's CDMP amendments.

To provide the transfer analysis, route-level passenger origin/destination and trip purpose data, an on-board passenger survey must be performed. The on-board survey performed as part of the CBOA was administered to a target sample rate of 8% of the weekday ridership at a route level. A survey of similar scope would need to be performed. The cost of this component of the CBOA, including data entry, origin/destination coding, and all analysis is approximately $190,000, which translates to about $216 per average daily system pullout (876), or $30 per average system one-way trip.

Recommendation 6: To provide the trip characteristics data (origin/destination, trip purpose, multi-modal connections, and MDT transfers) as an input to alignment review and planning, a system-wide on-board passenger survey should be performed at 5-year intervals.

Community Needs

Recommendations 1 through 5 address monitoring system components that concern operational issues and efficiently providing service to meet the needs of the populations already using transit. The final component is to assess the needs of the community at large, both transit users and all others through four mechanisms:

1. Survey transit passengers regarding their needs, preferences, and satisfaction.

2. Survey transit passengers' demographic characteristic by route, and compare with the characteristics of communities along the routes' service area to determine what markets the route is serving, and if there are potential transit markets left under served.

3. Survey samples of the community (non-transit riders and transit passengers) regarding their travel characteristics, demographics, needs, preferences, and satisfaction.

4. Schedule community meetings to receive input regarding needs and attitudes toward proposed improvements.

The first two mechanisms are easily added to an on-board passenger survey, as was done for the CBOA. The demographic analysis between the community at large and specific bus routes is to be addressed by District Transit Needs Assessments, the first of which is a pilot study for District 13 that is already under way. MDT intends to request the other 12 Commission District Transit Needs Assessments upon the completion of the pilot study and review of its output.

Recommendation 7: To determine passenger needs, attitudes and preferences, and to compare route passenger demographics with those of the communities that they serve so that underserved markets may be identified, questions regarding passenger demographics, attitudes, and preferences should be added to the five-year, system-wide on-board passenger survey of Recommendation 5.

In order to better understand the needs, attitudes, and preferences of the community at large (non-transit users as well as transit passengers), a telephone survey, broken down by specific communities, should be performed, and the results analyzed to provide insights as to how to better serve the community and how to increase transit use.

Finally, one of the best ways to obtain open-ended, qualitative information is to hold public workshops by community to gain an understanding of their needs, attitudes, as well as to obtain feedback to planned improvements.

Recommendation 8: A series of transit needs assessments should be performed, according to Commission District to analyze demographics to identify underserved markets in the communities. This information should be

integrated with a telephone survey and public meetings input to develop community needs assessments for specific communities. A specific scope should be determined upon completion of the District 13 Pilot Transit Needs Assessment that is currently underway.