

Overview of Bus Rapid Transit Opportunities as Part of an Integrated Multi-Modal Strategy to Alleviate Traffic Congestion in Miami-Dade County

Technical Memorandum One (1): Bus Rapid Transit Corridor Selection

Methodology and Results

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Introduction

The project “Overview of Bus Rapid Transit Opportunities as Part of an Integrated Multi-Modal Strategy to Alleviate Traffic Congestion in Miami-Dade County” complements, not duplicates, the Rapid Transit Expansion component of the *People’s Transportation Plan* (PTP) that calls for rapid transit expansion in a number of corridors in Miami-Dade County (MDC). This project examines the feasibility of establishing some elements of Bus Rapid Transit (BRT) in relatively quick fashion in the corridors noted in the *PTP* as well as numerous others. While some of these corridors might ultimately accommodate rapid rail further off in the future, it is still important to determine if it is possible to have some form of faster bus-based transit service in place prior to the time that rail is made available. This project identifies other existing arterials that could accommodate BRT treatments that can be implemented relatively quickly and inexpensively, that deserve more careful review in future studies. The project objective is to identify arterials in MDC where relatively low-cost BRT treatments can give Miami-Dade Transit (MDT) buses competitive advantages as they provide new and more frequent service, and to identify the most feasible types of BRT improvements that can be made in the shortest timeframe to improve mobility options and speed of travel.

To date, there has been some work on analyzing the prospects for implementing BRT improvements on existing arterials in MDC. Initial analysis has been done on the NW 27th Avenue and North Kendall Drive corridors. Of course, the South-Miami Dade Busway running parallel to US 1 already provides a successful form of BRT. The *Program of Projects* completed in 1993 identified the Northeast Corridor as a good candidate for BRT. What is needed now are specific recommendations on possible corridors and the types of BRT improvements that can be made in a relatively short time frame that can be operational many years before rail projects may be completed, and in a fashion that is economically sound to provide better options for MDC commuters. The introduction of a new, high-quality mode of transit that offers faster travel choices for bus riders, especially the transit-dependent is an integral part of the *PTP*.

Methodology

For Technical Memorandum One (1), a simple indexing-based process was used to rank and select potential BRT corridors in MDC. To maintain or otherwise improve service levels consistent with rapid transit service, BRT examples in other cities indicate first that a critical threshold of riders per mile must be met to justify further BRT study and implementation as well as determine the potential for transit usage within individual corridors. These were strong considerations when deciding which corridors in MDC to advance for further study.

The BRT corridor selection process involved three simple steps:

- Step 1: Identify a list of the potential candidate BRT corridors
- Step 2: Refine and evaluate candidate BRT corridors
- Step 3: Recommend candidate corridors for detailed analysis using a simple indexing based methodology

Identify Potential Candidate BRT Corridors

The *PTP* identifies rapid transit expansion in a number of specified corridors in MDC. *PTP* corridors are based on various levels of analysis during the last decade coupled with extensive public involvement. Based on this and thorough input from Miami-Dade Metropolitan Planning Organization (MPO) and MDT staff, a number of candidate BRT corridors were selected for initial refinement. These corridors represent those with the highest current concentration of MDT bus service and ridership as well as meeting the needs of the entire MDT transit system network in terms of connectivity, geographic east-west and north-south coverage, and potential success in terms of increased system and future corridor ridership resulting from forecasted growth and traffic congestion mitigation. Based on direction provided by the MPO, three additional expressway and tollway facilities were included as part of the corridor selection process. The potential BRT corridors are shown in Exhibit 1.

Exhibit 1: Potential BRT Corridors in Miami-Dade County

A	B	C	D	E
Proposed BRT Corridor	From	To	Candidate BRT Corridor Route Mileage /1	Rapid Transit Priority Status /2
Flagler Street	FL Turnpike	Government Center	12.37	Very High (PTP Corridor)
US 1 – Biscayne Boulevard	Aventura Mall	Downtown Miami	13.4	Very High (PTP Corridor)
LeJeune Road	Gratigny Parkway	Douglas Road Metrorail Station	10.93	Very High (PTP Corridor)
Kendall Drive	SW 147th Avenue	Dadeland South	7.07	Very High (PTP Corridor)
NW 79 th Street	NW 87th Avenue	Miami Beach	10.86	High
NW 7 th Avenue	Golden Glades	Downtown Miami	7.83	High
Coral Way	FL Turnpike	Brickell Metrorail Station	10.54	High
W 49 th Street	W 16th Avenue	NW 27th Avenue	5.3	High
SW 87 th Avenue	Dadeland South Metrorail Station	Palmetto Metrorail Station	11.27	High
SW 107 th Avenue	Eureka Drive (184 th Street)	Palmetto Metrorail Station	16.53	High
SW 137 th Avenue	South Miami-Dade Busway	Flagler Street	16.07	High
SW 152 nd Street	South Miami-Dade Busway	SW 162nd Avenue	7.16	Medium
Miami Gardens Drive	NW 87th Avenue	US 1 – Biscayne Boulevard	12.36	Medium
SW 40 th Street	SW 117th Avenue	Douglas Road Metrorail Station	9.1	Medium
NW 135 th Street	NW 12 th Avenue	US 1 – Biscayne Boulevard	10.26	Medium
Other Corridors for Additional Study /3				
SR 826 (Palmetto)	South Miami-Dade Busway	I-95	23.34	High
SR 836 (Dolphin)	I-95 (Downtown Miami)	FL Turnpike	11.66	High
Homestead Ext. FL Turnpike (HEFT)	South Miami-Dade Busway	Homestead/US-1	12.51	High

/1 Candidate BRT corridor route mileage calculated by CUTR GIS using ArcView software

/2 PTP stands for *People’s Transportation Plan*

/3 Three corridors currently being evaluated for study as part of MPO’s ongoing *Special-Use Lane Study*

Selection of BRT Corridors: Data, Approach, and Corridor Ranking

Data Sources

Key criteria were identified as influencing the success of BRT service in MDC and, in fact, any major transit investment. These criteria are:

- Current Transit Service – measures current corridor transit using average weekday ridership for the MDT bus routes currently serving the proposed BRT corridors.
- Corridor Transit Potential – measures transit potential using an index of current residential and employment density within a ½-mile walking distance of the possible BRT corridors. In addition, future transit potential was considered for total population,

total households, vehicles, workers, and employment for certain growth areas of MDC using mapped forecasted growth data from the MPO's 2030 Long-Range Plan.

- Corridor Transit Dependency – measures transit dependency using an index of percentage of households below poverty and percentage of households without vehicles.

Information for total average weekday rider boardings was obtained directly from MDT service planning from its *Omnibus* reporting system. The most recent data available from MDT was reported for October 2003. The ridership data reflect total average weekday boardings; data for weekend service was not included. Data for candidate BRT corridor length was calculated by CUTR's GIS department using ArcGIS 9.0 software. Recent employment and residential data were obtained from the 2000 US Census using a ½-mile buffer around each proposed BRT corridor, and data for future growth was obtained from the MPO. Transit dependency data included households with zero-auto ownership and households living in poverty. These data were obtained from the 2004 on-board survey performed by CUTR for MDT. Finally, data for future transit potential was obtained from maps provided as part of the MPO's 2030 Long-Rang Plan. These maps show projected total growth for population, households, vehicles, workers, and employment out to the year 2030. The maps used were dated March 30, 2004 and were provided to CUTR by the MPO for use in this technical memorandum.

Approach

The final evaluation process resulted in the ranking of the candidate BRT corridors. The challenge in selecting corridors for any rapid transit mode is to balance the individual ridership thresholds with other factors and the needs of the entire network in terms of connectivity, achieving geographic east-west and north-south coverage, potential success of the new rapid mode, and the need for transit service considering issues such as duplication and competition for the same markets as existing bus/rail service as well as saturating one part of the transit system's service area.

Given this, each of the potential BRT corridors was evaluated based on an indexing methodology that ranked current corridor transit usage, corridor transit potential, and

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corridor transit dependency. All else being equal, those proposed BRT corridors with the highest overall transit potential scores represent the best candidates for BRT improvements in the near-term.

The evaluation of the proposed BRT corridors consisted of analyzing transit usage, transit potential, and transit dependence variables using an indexed- and ranked-scoring process. This scoring process uses a “percentage of the best” approach, whereby the top scoring corridor in each criterion received “100 percent,” with the other proposed corridors receiving scores relative to the top score. For example, if the US-1/Biscayne Boulevard corridor percentage of zero-auto household ownership was the top score with 40 percent, it would receive an index score of 100 and Flagler Street’s corridor percentage for the same factor was 30 percent, it would receive a score of 75 and so on for each of the other potential BRT corridors in the analysis. An overall transit potential score was determined

Exhibit 2: Candidate Bus Rapid Transit Corridors for Miami-Dade County

A	B	C	D	E	F	G	H	I
Proposed BRT Corridor	Route Numbers for MDT Routes that Operate on all or a Portion of Candidate BRT Corridors	Total Average Weekday Boardings /1	Candidate BRT Corridor Route Mileage /2	Riders per Mile of Candidate BRT Corridor Length	Residential + Employment within 1/2-Mile Buffer of Corridor /4	Residential + Employment per Mile of Candidate BRT Corridor Length	Zero Auto Ownership /3	Annual Household Incomes Less than \$15k per Year /3
NW 79 th Street	107 (G), 112 (L)	13,542	10.86	1,248	135,133	12,443	50.3%	58.3%
Flagler Street	11, 51 (MAX)	15,353	12.37	1,241	156,608	12,660	46.8%	62.2%
NW 7 th Avenue	77	10,975	7.83	1,402	129,862	16,585	40.4%	59.1%
US 1 – Biscayne Blvd	3, 16, 93 (MAX)	15,770	13.4	1,177	127,147	9,489	47.1%	56.6%
SW 152 nd Street	35, 52, 252	6,013	7.16	840	31,245	4,364	43.8%	59.1%
Coral Way	Coral Way MAX (224), 24	4,344	10.54	412	140,088	13,291	44.2%	68.2%
Miami Gardens Drive	75, 83	8,677	12.36	702	142,773	11,551	31.5%	59.0%
LeJeune Road	42, 110 (J)	6,096	10.93	558	123,976	11,343	38.9%	45.7%
SW 40 th Street	40, 240	2,805	9.1	308	108,735	11,949	40.1%	54.1%
W 49 th Street	33	2,344	5.3	442	94,057	17,747	31.7%	57.5%
Kendall Drive	88, 104, 288	4,845	7.07	685	97,199	13,748	29.8%	44.0%
NW 135 th Street	28, 105 (E)	2,470	10.26	241	109,078	10,631	33.5%	53.0%
SW 87 th Avenue	87	2,031	11.27	180	91,928	8,157	34.4%	51.8%
SW 107 th Avenue	71	1,507	16.53	91	158,028	9,560	28.6%	54.3%
SW 137 th Avenue	West Dade Connection (137)	1,150	16.07	72	76,285	4,748	32.4%	60.8%

/1 Metro-Dade Transit *Omnibus* ridership report dated October 2003.

/2 Candidate BRT corridor route mileage calculated by CUTR GIS using ArcView software.

/3 Obtained from recent on-board survey of Miami-Dade Transit bus system conducted by CUTR. These data represent actual ridership characteristics for each existing MDT bus route listed in Column B.

/4 Data obtained from the 2000 US Census.

by averaging the scores across the four criteria. The results are presented in Exhibit 2 and Exhibit 3.

Ranking

The implementation of BRT service in MDC has been prioritized into two tiers following the recommended rapid transit expansion schedule from the *PTP* for years 2003 to 2025. Tier I BRT corridor implementation is for years 2005 through 2010 and Tier II are for 2011 to 2025. It is anticipated that Tier I represents the highest priority corridors for BRT service. Depending on the costs associated with the necessary improvements, it is possible that BRT implementation could occur more quickly than the schedule suggested in Exhibit 3.

Exhibit 3: Rank Scores of Candidate Bus Rapid Transit Corridors for Miami-Dade County

A	B	C	D	E	F	G	H
Proposed BRT Corridor (Rank Order Based on Overall Transit Potential Score in Column F)	Riders per Mile Score	Residential + Employment Score	Household Zero-Auto Ownership Score	Household Income Poverty Score	Overall Transit Potential Score /1	Implement Timeframe	Tier Inclusion
Flagler Street	88.5	99.1	93.0	91.2	92.97	2005 to 2010	I
NW 79 th Street	89.0	85.5	100.0	85.5	90.00	2005 to 2010	I
NW 7 th Avenue	100.0	82.2	80.3	86.7	87.29	2005 to 2010	I
US 1 – Biscayne Boulevard	84.0	80.5	93.6	83.0	85.26	2005 to 2010	I
Coral Way	29.4	88.6	87.9	100.0	76.48	2005 to 2010	I
Miami Gardens Drive	50.1	90.3	62.6	86.5	72.39	2011 to 2030	II
LeJeune Road	39.8	78.5	77.3	67.0	65.65	2005 to 2010	I
SW 152 nd Street	59.9	19.8	87.1	86.7	63.36	2011 to 2030	II
SW 40 th Street	22.0	68.8	79.7	79.3	62.46	2011 to 2030	II
SW 107 th Avenue	6.5	100.0	56.9	79.6	60.74	2005 to 2010	I
W 49 th Street	31.5	59.5	63.0	84.3	59.59	2005 to 2010	I
Kendall Drive	48.9	61.5	59.2	64.5	58.53	2005 to 2010	I
NW 135 th Street	17.2	69.0	66.6	77.7	57.63	2011 to 2030	II
SW 87 th Avenue	12.8	58.2	68.4	76.0	53.84	2005 to 2010	I
SW 137 th Avenue	5.1	48.3	64.4	89.1	51.74	2005 to 2010	I

/1 Average of Columns B through E

Other Corridors for Additional Study

Additionally, MPO staff has requested that the universe of potential BRT corridors be expanded for this project to include the following expressway and tollway facilities in

MDC for BRT special-use lane treatment: SR 826 (Palmetto) and SR 836 (Dolphin) expressways and the Homestead Extension of the Florida Turnpike (HEFL). Exhibit 4 shows the overall transit potential score determined by averaging the score for the transit potential (residential + employment density) for the three facilities. There are currently no MDT bus services operating on these three facilities.

SR 836 has been the subject of intensive study for the application of special-use lanes such as an exclusive BRT travel way. To date, no special-use lanes have been implemented on SR 836 and there currently is no MDT bus service operating on it. Based on the results shown in Exhibit 4, SR 836 is the strongest candidate for any new special-use lanes to accommodate future BRT service. An east-west special-use lane for BRT service on SR 836 could provide additional intra-county mobility and transportation options.

Exhibit 4: Rank Scores of Expressway and Tollway Corridors for Miami-Dade County

A	B	C	D	E	F	G
Proposed BRT Corridor	Riders per Mile Score /1	Residential + Employment Score /3	Household Zero-Auto Ownership Score /2	Household Income Poverty Score /2	Overall Transit Potential Score /4	Rank Order Based on Overall Transit Potential Score
Dolphin Expressway (SR 836)	NA	100.0	NA	NA	100.0	1
Palmetto Expressway (SR 826)	NA	69.2	NA	NA	69.2	2
Florida Turnpike Homestead Extension	NA	34.4	NA	NA	34.4	3

/1 Data not available from the Metro-Dade Transit Omnibus ridership report dated October 2003; no MDT bus service currently operating on these facilities.

/2 Data not available from recent on-board survey of Miami-Dade Transit bus system conducted by CUTR; no MDT bus service currently operating on these facilities.

/3 Data obtained from the 2000 US Census.

/4 Average of Column C.

The Miami-Dade County MPO is currently sponsoring a *Special-Use Lane Study* to investigate the creation of special-use lanes to enhance mobility and travel options across MDC. The MPO feels that the creation of a linked system of special-use lanes could lead to stronger utilization of arterials such as Flagler Street and freeways such as the Palmetto Expressway. The *Special-Use Lane Study* is proposing an interconnected system that includes, as mentioned, facilities both on freeways and on arterials. While the *Special-Use Lane Study* makes reference to the feasibility of BRT in freeway and arterial corridors, it refrains from making specific recommendations about actual BRT facilities; this study is charged with that task.

Next Steps

As shown in Exhibit 3, there are 11 corridors included as part of Tier I BRT corridors. These corridors should receive highest priority for further analysis and implementation of some type and configuration of BRT service during the recommended implementation timeframe. For example, the high priority rapid transit *PTP* corridors of Flagler Street and Biscayne Boulevard could be implemented in the near term as possible BRT demonstration project(s).

Based on the results shown in Exhibit 3, CUTR will study further the top 11 candidate BRT corridors listed in Tier I as part of the “Overview of Bus Rapid Transit Opportunities as Part of an Integrated Multi-Modal Strategy to Alleviate Traffic Congestion in Miami-Dade County” project. The top ranking corridors are those where BRT treatments such as transit signal priority and wider stop spacing can give MDT buses competitive advantages as they provide new and more frequent rapid bus service throughout MDC.

Due to data limitations, the results in Exhibits 2 and 3 look only at current conditions in MDC and not conditions over a long-term horizon. Of course, total population and other factors will not remain constant in the future. Between 2000 and 2030, the MPO estimates that in MDC population will increase by 43 percent, housing by 40 percent, employment by 34 percent, number of automobiles by 48 percent, and person-trips by 40 percent when compared to current levels. Along with this growth, increasing demands will be placed on the public transit system. Meeting future transportation needs is made even more complex by the multi-directional nature of daily travel throughout MDC. The predominant suburb-to-downtown commute pattern that many large cities experience does not exist as prominently in MDC. While Downtown Miami remains a major trip attractor, people commute from everywhere to everywhere in MDC. While this means that demand is spread throughout the system rather than concentrated in a few corridors, it also means that improvements, and therefore additional resources, are needed throughout including the rapidly growing southwest portion of MDC. Population and other transit-oriented trends developed by the MPO indicate that rapid growth is

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occurring in the southwest portion of MDC; in fact it is one of the fastest growing areas of the county. Based on this, it was decided that SW 152nd Avenue, SW 137th Avenue, and SW 107th Avenue should be included as Tier I BRT corridors. While the original corridor selection process ranked these three corridors low, this is attributable to their current levels of public transit service (one hour headways vs. 10 minute headways, which have a significant negative effect on current ridership). Due to the rapid growth in this area of MDC, it is anticipated the level of public transit service and ridership will more closely mirror that of one of the more mature, higher ranked corridors shown in Exhibit 3 in the future. These corridors will be subject to more detailed analysis and evaluation in Technical Memorandum Three (3) of this study.