METRORAIL/COCONUT GROVE CONNECTION STUDY

DRAFT

BACKGROUND RESEARCH

Technical Memorandum Number 2

&

TECHNICAL DATA DEVELOPMENT

Technical Memorandum Number 3

Prepared for

Prepared by

Reynolds, Smith and Hills, Inc.

6161 Blue Lagoon Drive, Suite 200

Miami, Florida 33126

December 2004

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TABLE OF CONTENTS

Page

List of Appendices

List of Tables

List of Figures

1.0 INTRODUCTION

The purpose of the Metrorail/Coconut Grove Connection Study is to examine the feasibility of implementing an exclusive right-of-way transit connection between the Metrorail line and the Coconut Grove Village Center. This report documents the background research for the study. It includes: a summary of possible transit modes, local systems implemented or planned, national and international research, and a comparative analysis of transit alternatives for the project.

2.0 STUDY DESCRIPTION

For many years, a more effective way to better link Metrorail with nearby activity centers has been needed. Transportation planners have suggested various ways to improve linkages between the Metrorail system and surrounding areas of trip origins and destinations along the system in the past.

Coconut Grove has proven to be one of the more popular places for tourists to visit while in Miami. Furthermore, the "Grove," as the area is locally known, is host to a variety of street fairs, art shows, and craft venues, along with the successor to the King Orange Parade, the Mango Strut, all attended by thousands throughout the year. Attendees usually access the small town-like Village Center by personal vehicle. Additionally, thousands more regularly attend shows at the Convention Center, such as the Annual Coconut Grove International Boat Show.

Tourism and recreation are regular and usual activities that bring hundreds upon hundreds of cars carrying thousands of tourists and locals into the area on many weekdays and virtually all weekends to sample the ambiance of the Grove. The high number of vehicles arriving and traveling through the area puts enormous pressure on the transportation system. Too often, local gridlock occurs despite the prohibition of cruising and the relatively recent addition of parking structures and lots.

On the majority of special event weekends, the pressure intensifies even beyond the high street congestion and scarcity of parking experienced on typical weekends. Streets, otherwise open for both vehicular movement and parking, are frequently closed during the special events. More vehicles are forced onto an even lesser capacity network, and traffic jams are more frequent and often lengthy. The nation's largest art show, The Coconut Grove Arts Show, attracts an estimated 1.25 to 1.5 million visitors to the Grove. Spillover parking takes place as far away as US-1, some 3/4 mile from the venue, and traffic backups extend almost as far.

In addition to regular bus service routed from Metrorail into the Village Center, a dedicated Coconut Grove Transit Circulator Service has been recently introduced. Special events shuttle bus services to venues from Metrorail have been tried in the past, but they suffered from the same congestion problems that all motorized surface vehicles face: they get stuck in traffic.

As indicated, the purpose of this study is to examine the feasibility of an exclusive right-of-way transit connection between the Metrorail line and the Coconut Grove Village Center. It will also assess the advantages or disadvantages of possible transit modes including enhanced bus services, bus rapid transit, trolley bus services, suspended (cableway) trams, automated people movers, light rail transit, heavy rail, or monorail, all using the exclusive right-of-way approach.

The Metrorail line runs parallel to US-1 on the north side. The Coconut Grove Station, the closest stop Metrorail has to the Grove, is located just west of SW 27th Avenue. The Coconut Grove Village Center is situated near the intersection of Main Highway and Grand Avenue. The project study area, along with the major points of interest, is shown in Figure 1.

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Architecture, Engineering and Planning

PROJECT LOCATION MAP

FIGURE 1

3.0 TRANSIT MODES DESCRIPTION

One of the objectives of this study includes assessing the advantages and disadvantages of possible transit modes. A **mode** is a system for carrying transit passengers described by specific right-of-way, technology, and operational features. The transit modes being considered include enhanced bus services, bus rapid transit, trolley bus services, suspended/cableway trams, automated guideway transit, light rail transit, heavy rail, and monorail. The following sections provide description on each of the transit modes being considered.

Exclusive Right-of-Way is a roadway or other right-of-way reserved at all times or peak times for transit use and/or other high occupancy vehicles. The restriction must be sufficiently enforced so that 95 percent of vehicles using the right-of-way are authorized to use it.

3.1 ENHANCED BUS SERVICES

Bus mode uses vehicles powered by diesel, gasoline, battery, or alternative fuel engines contained within the vehicle. Buses are rubber-tired vehicles operating on fixed routes and schedules on roadways. There are generally three types of bus service: local, express, and limited-stop.

Local service, where vehicles may stop every block or two along a route several miles long, is by far the most common type of bus service. Trolleybuses, unless bypass overhead wiring is available, cannot pass the trolleybus in front of them, and thus generally operate in local service only.

When limited to a small geographic area or to short-distance trips, local service is often called circulator, feeder, neighborhood, trolley, or shuttle service. Such routes, which often have a lower fare than regular local service, may operate in a loop and connect, often at a transfer center or rail station, to major routes for travel to more far-flung destinations. Examples are office park circulators, historic district routes, transit mall shuttles, rail feeder routes, and university campus loops.

Express service speeds up longer trips, especially in major metropolitan areas during heavily patronized peak commuting hours, by operating long distances without stopping. Examples include park-and-ride routes between suburban parking lots and the central business district that operate on freeways, and express buses on major streets that operate local service on the outlying portions of a route until a certain point and then operate non-stop to the central business district.

Limited-stop service is a hybrid between local and express service, where the stops may be several blocks to a mile or more apart to speed up the trip.

3.2 BUS RAPID TRANSIT

Bus Rapid Transit (BRT) includes operating buses on exclusive bus highways, High-Occupancy Vehicle (HOV) lanes, or improving service on busier routes on city streets. Bus Rapid Transit may also include a variety of technological and street design improvements, including traffic signal prioritization for buses, exclusive lanes, better stations or bus shelters, fewer stops, faster service and cleaner, quieter and more attractive vehicles.

Busways are special roadways designed for the exclusive use of buses. They can be totally separate roadways or operate within highway rights-of-way separated from other traffic by barriers. Buses on HOV lanes operate on limited-access highways designed for long-distance commuters. Bus Rapid Transit on busways or HOV lanes is sometimes characterized by the addition of extensive park and ride facilities along with entrance and exit access for these lanes. Bus Rapid Transit systems using arterial streets may include lanes reserved for the exclusive use of buses and street enhancements that speed buses and improve service. Other significant variants that fall under the umbrella of the BRT definition include express bus service, traffic signal priority technologies, and faster passenger boarding techniques.

3.3 TROLLEY BUS SERVICES

Trolleybus mode uses vehicles propelled by a motor drawing current from overhead wires via a connecting pole called a trolley from a central power source not on board the vehicle. A **trolleybus** is also known as "trolley coach" or "trackless trolley".

Although their operations are less flexible than that of motorbuses, trolley buses are more energy efficient, much quieter, and much less polluting. Also, they operate better on hills, require less maintenance, and are longer lasting than motorbuses. Modern trolley buses have an auxiliary power unit (APU), which allows the buses to travel off-wire for several blocks and avoid anything blocking their normal route, such as an excavation in the street or a street fair. The use of trolley buses is generally restricted to lines on which a high-enough frequency of service can justify the expense of the electric power system installation and vehicle costs.

3.4 SUSPENDED/CABLEWAY TRANSIT

Suspended/Cableway Transit, also known as **aerial tramway,** is an electric system of aerial cables with suspended powerless passenger vehicles. The vehicles are propelled by separate cables attached to the vehicle suspension system and powered by engines or motors at a central location not on board the vehicle.

Aerial cable lifts have been transporting passengers reliably and safely for over 100 years with carrying capacities ranging from 100 persons per hour to over 4,000 persons per hour for single systems. They range in length from one-tenth of a mile to over 5 miles in distance, and they can have one station at either end or can have multiple stations along the route when operated as people movers. The size of the passenger cabins range from 4 to 200 persons per cabin, depending upon the type of system and application.

3.5 AUTOMATED GUIDEWAY TRANSIT

Automated guideway transit (personal rapid transit, group rapid transit, people mover) is an electric railway (single or multi-car trains) of guided transit vehicles operating without an onboard crew. Service may be on a fixed schedule or in response to a passenger activated call button. Automated guideways in non-transit settings such as airports and hospital campuses are more common.

3.6 LIGHT RAIL TRANSIT

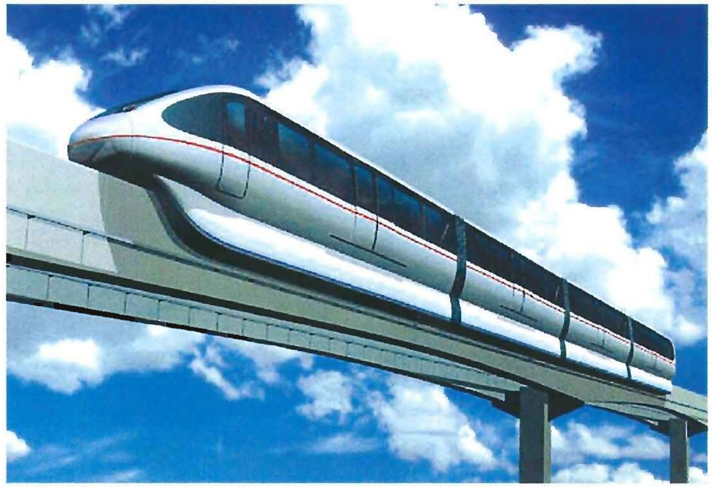
Light rail transit (streetcar, tramway or **trolley)** is lightweight passenger rail cars operating singly (or in short, usually two-car, trains) on fixed rails in right-of-way that may be shared or exclusive. This electric railway has a light volume of traffic capacity compared to heavy rail. Light rail vehicles are typically driven electrically with power being drawn from an overhead electric line via a trolley or a pantograph at ground level, on aerial structures, in subways, or in streets to board and discharge passengers at track or car-floor level.

3.7 HEAVY RAIL

Heavy rail (metro, subway, rapid transit, or **rapid rail)** is an electric railway with the capacity for a heavy volume of traffic. It is characterized by high speed and rapid acceleration passenger rail cars operating singly or in multi-car trains on fixed rails; separate rights-of-way from which all other vehicular and foot traffic are excluded; sophisticated signaling, and high platform loading. If the service were converted to full automation with no onboard personnel, the service would be considered an automated guideway.

3.8 MONORAIL

Monorail is an electric railway of guided transit vehicles operating singly or in multi-car trains. The vehicles are suspended from or straddle a guideway formed by a single beam, rail, or tube. Their most common use is in the non-transit settings of amusement parks. If the trains do not have an onboard crew, they are also considered automated guideways.



4.0 LOCAL STUDIES AND EFFORTS

Research was conducted on local studies and efforts for the transit modes described in section 3.0. The research included public and private ventures for transit systems servicing any purpose. Proposed concepts and planned applications, as well as actual systems in place, are documented in the following sections.

4.1 EXISTING SYSTEMS

4.1.1 Enhanced Bus Services

<u>Miami-Dade Transit</u>

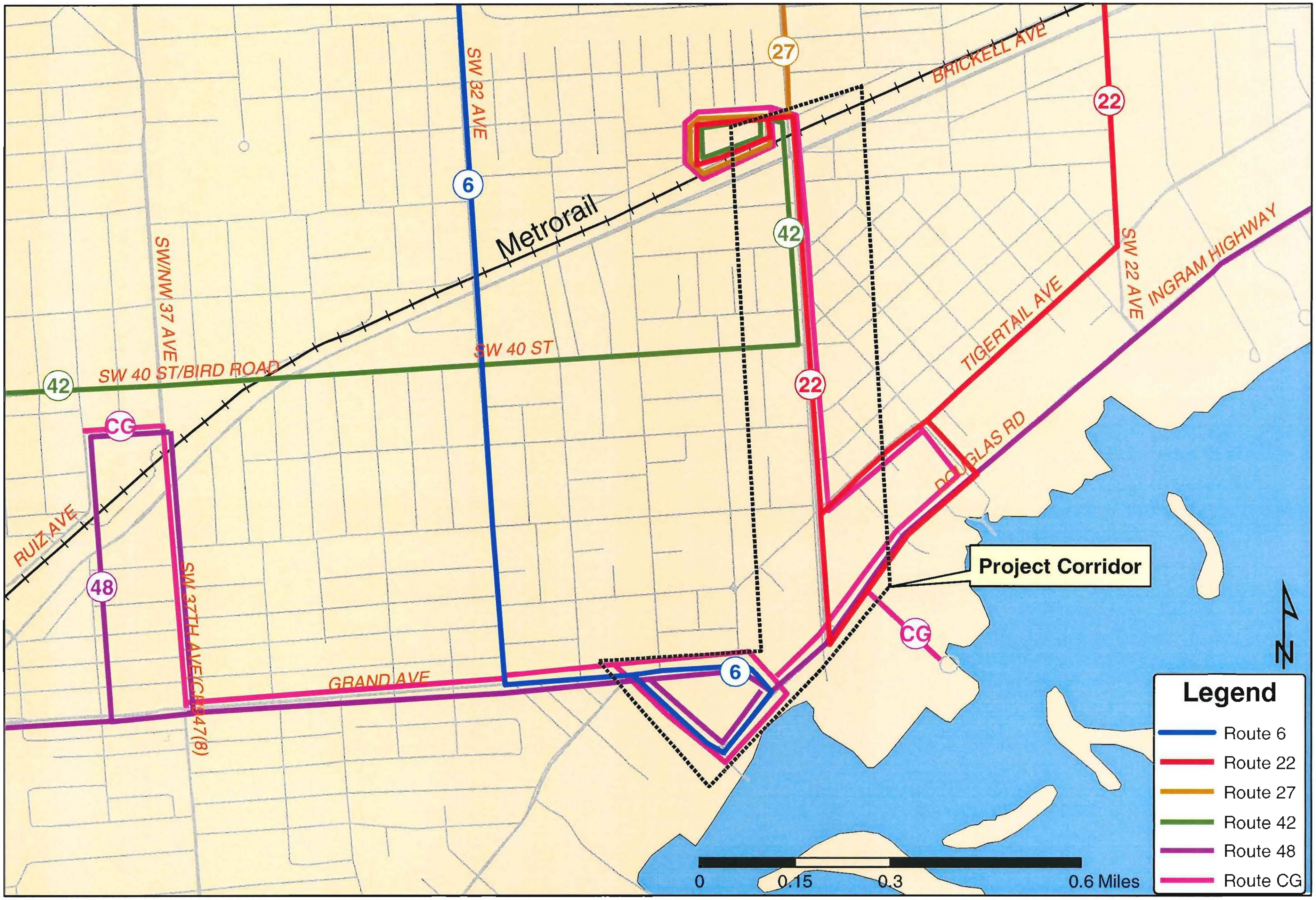
Miami-Dade Transit provides bus service throughout Miami-Dade County 24 hours per day, 365 days a year. Service is available from Miami Beach and Key Biscayne to West Miami-Dade, as far north as Diplomat Mall in Broward County, and as far south as Homestead, Florida City, and the Middle Keys.

The Metrobus system, designed to intersect with Metrorail and Metromover, serves all major business, shopping, entertainment, and cultural centers, as well as major hospitals and schools.

Based on information from the Miami-Dade Transit website as of this study, the fleet is made up of 580 directly operated, 40-foot buses and 66 directly operated, 60-foot buses, 184 minibuses, and 95 vans. During peak periods, the vehicle requirements are 564 buses.

In total, there are 92 bus routes, including lifeline services, traveling throughout Miami-Dade, plus special events Park & Ride service.

Existing and planned bus routes, including bus stops, were obtained from Miami-Dade Transit. Figure 2 shows the MDT bus routes within the study area. Six existing MDT bus routes intersect the corridor as listed in Table 1:



RS&H Architects - Engineers - Planners

Miami-Dade MPO Metropolitan Planning Organization

EXISTING MIAMI-DADE TRANSIT BUS ROUTES

Figure 2

Table 1
Existing MDT Bus Routes

Route Number	Service Areas
6	• South Bayshore Drive/McFarlane • Coconut Grove Metrorail Station • Musa Isle • Little Havana • Brickell Metrorail Station • Downtown Miami • Miami Avenue Metromover Station • NW 29th Street • NW 19th Ave/12th Street
22	• City of North Miami Beach • The Mall at 163rd Street • Golden Glades Park & Ride • NW 22nd Avenue • Earlington Heights Metrorail Station • Santa Clara Metrorail Station • Civic Center Metrorail Station • UM/Jackson Memorial Hospitals & Clinics • Coconut Grove Metrorail Station
27	• Calder Race Track • Pro Player Stadium • Carol City • NW 27th Avenue • Miami-Dade College North Campus • Martin Luther King Jr. Metrorail Station • Brownsville Metrorail Station • Coconut Grove Metrorail Station
42	• Golden Glades Park & Ride • City of Opa-Locka City Hall • Opa-Locka Tri-Rail Station • City of Hialeah • East 8th Avenue (LeJeune Road) • Amtrak Passenger Terminal • Tri-Rail Metrorail Station • Miami International Airport • City of Coral Gables • Douglas Road Metrorail Station • Coconut Grove Metrorail Station
48	• Santa Clara Metrorail Station • Jackson Memorial Hospital • Somerville Residences • Downtown Bus Terminal • Brickell Avenue Business District • Mercy Hospital • Douglas Road Metrorail Station • Coconut Grove • City of Coral Gables • University Metrorail Station • South Miami Metrorail Station
Coconut Grove Circulator	• Douglas Road Metrorail Station • Grand Avenue • Coconut Grove • Miami City Hall • SW 27th Avenue • Coconut Grove Metrorail Station

Coral Gables Trolley

The new Coral Gables Trolley free service began last fall. Currently, an average of 1,300 riders per day takes advantage of the ease and convenience of "trolleying" around Coral Gables. There are five, hybrid-electric vehicles in the trolley fleet. The trolleys are part of the Urban Improvement Program of the City of Coral Gables, which was set in place to assist the flow of traffic in the commercial areas and to provide connectivity to the Metrorail. The trolleys, which seat approximately 22 people and hold an additional 15 passengers standing, are expected to have an estimated annual ridership of 250,000. The fleet of hybrid-electric trolleys was created by Ebus, Inc. in Downey, CA, and is the first of its kind in Florida. It receives funding from Miami-Dade County, the Florida Department of Transportation, and the half penny sur-tax.

Miami Beach ELECTROWAVE

The ELECTROWAVE electric shuttle bus system allows residents and visitors to more conveniently enjoy the South Beach area, while reducing traffic congestion, parking problems and air pollution. ELECTROWAVE is the first electric shuttle bus system in Florida. Electric vehicles were chosen because their cutting-edge transportation technology makes them the cleanest, quietest, most cost-effective mass-transit alternative for South Beach. The fleet of eleven shuttles are moving works of art with murals and other designs across the vehicle's panels. The shuttles run north and south along one of South Beach's busiest corridors of shops, cafes, clubs and other hot spots and a short walk from world-famous Ocean Drive. The Miami Beach Transportation Management Association and the City of Miami Beach developed the ELECTROWAVE through funding partnerships from Florida Department of Transportation, Florida Power and Light, Florida Alliance for Clean Technologies, Clean Cities, the Florida Department of Environmental Protection and the International Council for Local Environmental Initiatives.

Hialeah Transit

The Hialeah Transit System provides a safe, reliable and quality transportation service. It provides links to city offices, parks, and hospitals throughout the City of Hialeah. There are two routes, the Flamingo and the Marlin.

The bus transit route maps for each system are included in Appendix A.

4.1.2 Bus Rapid Transit

The South Miami-Dade Busway, the first of its kind in Florida, is an 8.2-mile roadway built in 1997 exclusively for buses. Express buses travel the exclusive busway lanes, swiftly shuttling passengers to Metrorail and stopping at 16 bus stations along the way. A one-way trip between Cutler Ridge and Dadeland South takes only 25 minutes.

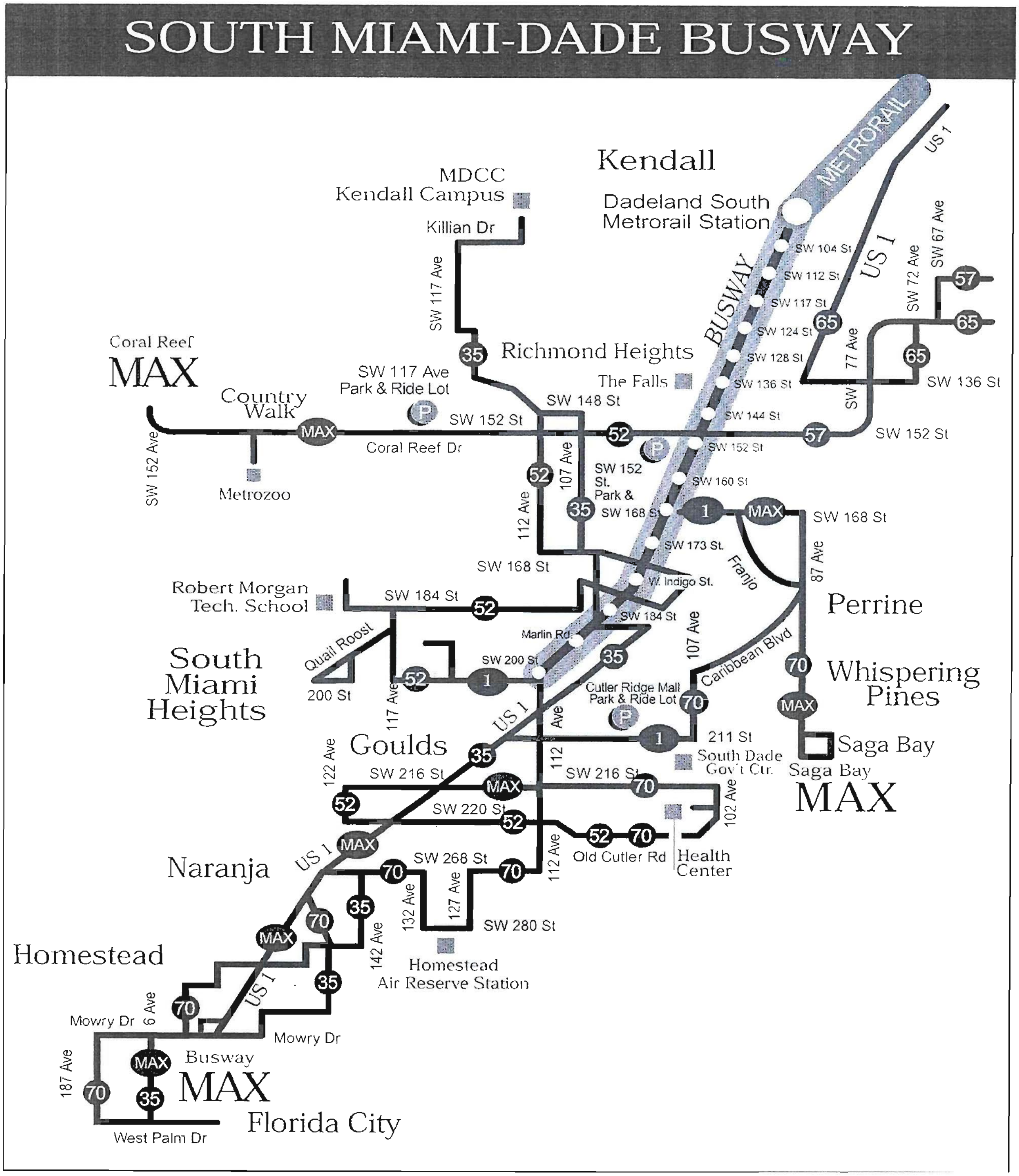
A state-of-the-art alternative to traffic congestion, the busway runs parallel to (and separate from) US-1. The Florida Department of Transportation (FDOT) built the $21-million roadway on an abandoned Florida East Coast Railroad right-of-way. Figure 3 shows the location of the South Miami-Dade Busway.

4.1.3 Trolley Bus Services

There is no trolley bus service in Miami-Dade County.

4.1.4 Suspended/Cableway Trams

Currently, there are no suspended trams in Miami-Dade County.



RS&H	MIAMI-DADE MPO Metropolitan Planning Organization	Existing Local BRT Service	Figure 3

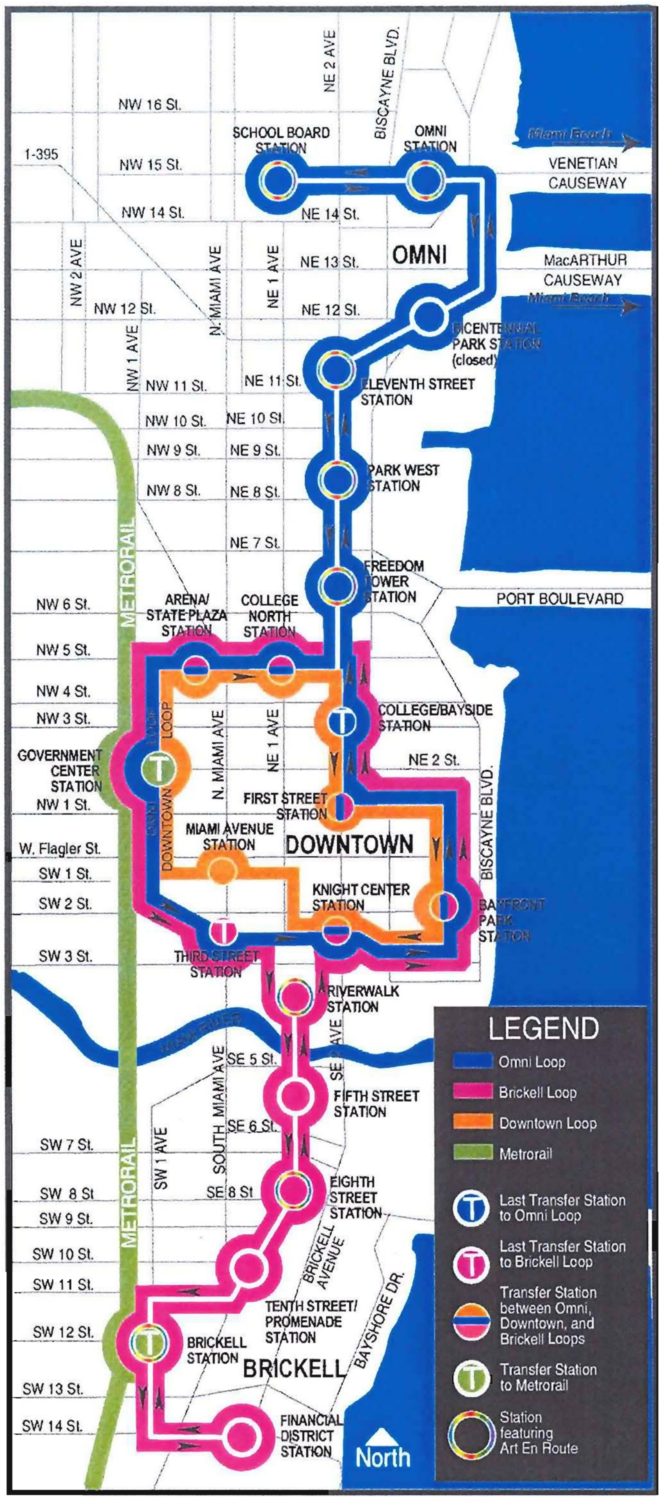
4.1.5 Automated Guideway Transit

Metromover is a 4.4-mile, elevated, automated people-mover system that serves Downtown Miami from Omni to Brickell and connects with Metrorail at Government Center and Brickell stations and with Metrobus at various locations throughout downtown Miami. There are 21 conveniently located, wheelchair accessible Metromover stations, one about every two blocks.

Metromover offers free convenient access to many of Downtown Miami's major office buildings, hotels, and retail centers, the Stephen P. Clark Government Center, the Cultural Plaza (Miami Art Museum, Historical Museum, Main Library), and the Brickell business district. Other destinations include American Airlines Arena, Bayside Marketplace, the Miami Arena, Miami-Dade College, the James L. Knight Center, the Miami-Dade County School Board, and The Miami Herald. Metromover has an inner loop serving central downtown an outer loop serving the Omni and Brickell areas.

The original system, consisting of a 1.9-mile elevated double loop, opened for service in 1986 at a cost of $153.3 million. It has a fleet of 29 single units that stop at nine stations. Metromover's inner and outer loops run from 5 a.m. to midnight on weekdays, Saturday, and Sunday. The outer loop serving Brickell and Omni operates as one continuous loop from 7 p.m. to midnight seven days a week. Trains arrive every 90 seconds during rush hours and every three minutes during off-peak hours.

The Omni/Brickell Routes were extended in 1994 at a cost of $228.0 million. The extension has a fleet of 17 new cars (29 total system). Each car is designed to carry 88 standing and 8 seated passengers. The Omni extension is 1.4 miles, and the Brickell extension is 1.1 miles. Six stations were added to both extensions, bringing the total Metromover stations to 21. The Metromover route map is shown in Figure 4.



RS&H	MIAMI-DADE MPO Metropolitan Planning Organization	Existing Local Automated Guideway Transit	Figure 4

4.1.6 Light Rail Transit

Currently, there are no light rail transit systems in Miami-Dade County.

4.1.7 Heavy Rail

Metrorail is an electrically powered, elevated, rapid transit system that extends 22.4 miles from Kendall in South Miami-Dade to Medley in West Miami-Dade. Metrorail connects a major portion of Miami-Dade County to business, cultural, and shopping centers. Travel from one end of the system to the other is only 42 minutes.

Metrorail service started in 1984 at a cost of $1.03 billion. It has a fleet of 136 cars with a carrying capacity of 164 passengers per car, and operates at a top speed of 58 mph, with an average speed of 31 mph. Metrorail stops at 22 stations located throughout Miami-Dade County. It operates from 5 a.m. to midnight, seven days a week, including holidays. The map of the Metrorail system is shown in Figure 5.

4.1.8 Monorail

The Miami Metrozoo monorail crosses zoo walkways 30 times. Universal Mobility Inc. built the monorail in 1982 to provide an overview of one of the world's largest modern open zoos.

RS&H	MIAMI-DADE MPO Metropolitan Planning Organization	Existing Local Heavy Rail	Figure 5

4.2 PLANNED AND PROPOSED CONCEPTS

With the passage of the half-penny transportation surtax, the People's Transportation Plan (PTP) provides a dedicated funding source for transportation improvements.

4.2.1 Enhanced Bus Services

A major component of the People's Transportation Plan (PTP) is adding bus service routes and increasing the frequency of these routes. These improvements are to be implemented within the five-year program (2003-2008). The following are some of the improvements planned under the PTP that will add more buses and provide more service throughout the entire county:

- Nearly double the existing bus fleet by adding 635 new buses
- Increase service miles from 27 to 45 million
- Use minibuses on all new routes and in neighborhood circulator services
- Replace older buses to increase reliability and reduce operating costs
- Increase frequency of bus service to 15 minutes or better during rush hour and 30 minutes or better at all other times
- Add midday, Saturday, and Sunday bus service within 30 days of approval of the plan; increase bus service to 24 hours on certain routes
- Provide free transit service to all senior citizens 65 years and older regardless of income
- Increase annual operating hours from 1.9 to 3.3 million

The only service improvements being planned for MDT bus routes in the study area are for Route 22. The improvements include:

- Improving peak headway from 20 to 15 minutes north and 30 minutes to Civic Center and Coconut Grove branches by November 2004
- Adding overnight service every 60 minutes, by 2008

4.2.2 Trolley Bus Services

Currently, there are no plans for a trolley bus system in Miami-Dade County.

4.2.3 Bus Rapid Transit

MDT's Busway Phase II Bus Rapid Transit effort continues south 11.48 miles from the existing South Miami-Dade busway in Cutler Ridge. MDT is developing this project in two parts. Segment 1 extends the busway 5 miles to SW 264 Street; segment two, 6.48 miles, will extend to SW 344 Street. Construction plans include five bridges; another 12 bus stations replete with amenities, such as telephones and newspaper racks; landscaping the length of the project with plants native to Florida; and a continuation of the South Florida Greenway, a bike path spanning the southern end of the state. The total investment for construction of this transportation project is an estimated $43 million.

The Kendall Corridor is one of the projects being planned under the People's Transportation Plan (PTP) that may be determined to be either a BRT or some other rail mode. The 15-mile corridor route extends from Kendall Drive (88th Street) and SW 157th Avenue east to the Dadeland area, and north to SR 836 and the FEC right-of-way to the Miami Intermodal Center (MIC) and has an estimated completion date for construction as 2017. Maps for the Busway Phase II and the Kendall Corridor are included in Appendix E.

4.2.4 Suspended/Cableway Trams

Based upon discussions with Miami-Dade officials, no previous formal Aerial Cableway People Mover's (ACPM) studies regarding urban transport have been performed in South Florida.

In 2002, a local company, Eco-Transit, proposed an aerial cableway system between Bay Front Park, Bayside, American Airlines Arena, the planned Performing Arts Center, and the attractions on Watson Island by running alongside Biscayne Boulevard and then crossing over Biscayne Bay to Watson Island. A future phase, extending the ACPM System along the MacArthur Causeway to South Beach was proposed as well. Conceptual planning data indicated that the project would be technically and economically feasible as either a private or a public/private venture.

Also in 2002, ACPM technology was presented to the Miami-Dade Aviation Department (MDAD) and the Dade Aviation Consultants by Eco-Transit for consideration as a possible technology for the MIC-MIA Connector people mover at MIA. This had been requested by MDAD for informational purposes only. This preliminary study presented 4 alternate route alignments that serviced the parking garages and the concourses themselves with an approximate passenger carrying capacity of 2,500 persons per hour per direction, considering a vehicle floor space allocation, which would include baggage and baggage carts.

In 2003, the Coconut Grove Chamber of Commerce requested information from Eco-Transit regarding the Metrorail to Coconut Grove connection via an aerial cableway system to relieve parking and traffic congestion, to help revitalize the under-used Convention Center, to provide transit service for the many special events in the Grove and to provide a commuter link up to the Metrorail, Metromover, etc. A private, preliminary study was undertaken regarding the feasibility of the route, the positioning of stations, the passenger carrying capacity, and an estimate of the capital and O&M costs. This data was presented to the Coconut Grove Chamber, the City of Miami, and the MPO Transportation Planning Council (TPC) in early 2004.

4.2.5 Automated Guideway Transit

Currently, there are no plans for extending the existing Metromover system or adding new automated guideway transit in Miami.

4.2.6 Light Rail Transit

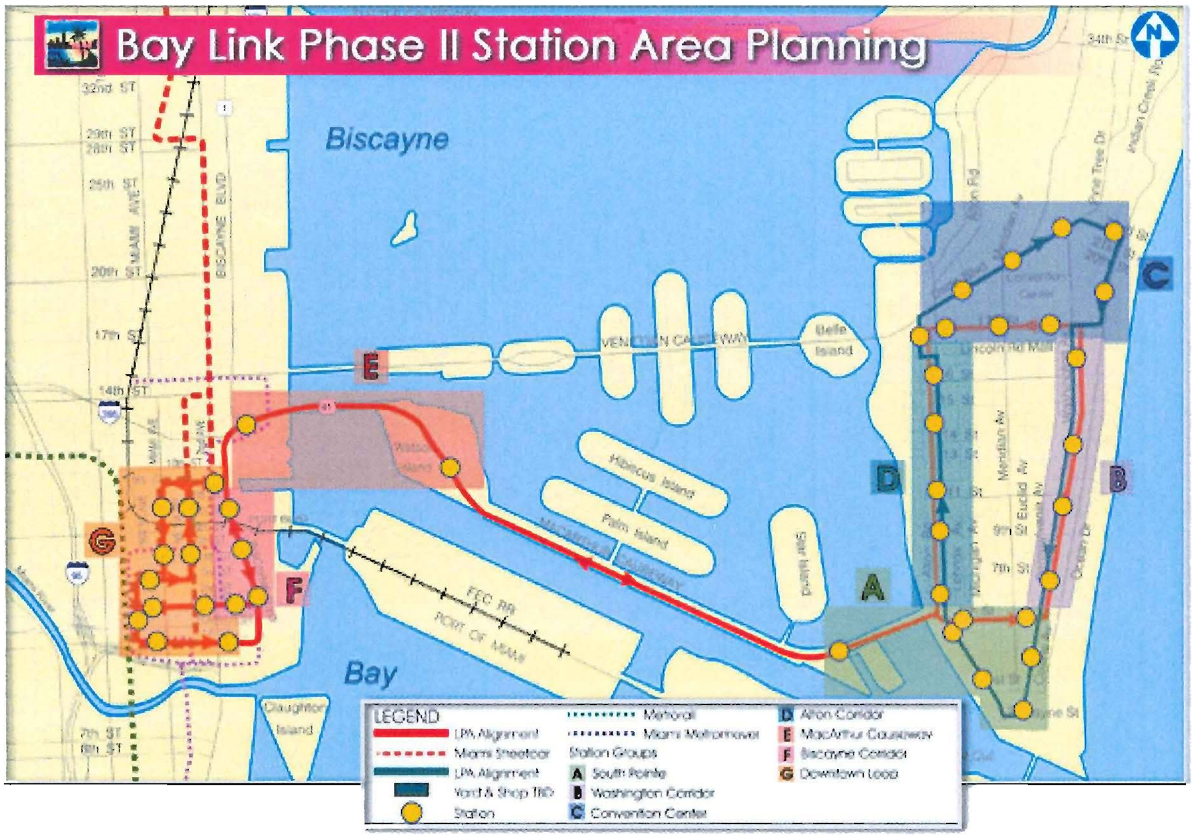
Bay Link is a proposed streetcar line providing a regional transit connection between Downtown Miami and Miami Beach (see Figure 7). The $488-million, 18-mile rail route, proposed by the Metropolitan Planning Organization (MPO), would link the areas across the MacArthur Causeway with modern streetcars as part of a program to reduce traffic. The Miami-Dade County Board of Commissioners has projected completion of the proposed Bay Link streetcar project to be around 2023. A feasibility study is underway into a proposed streetcar line that would link downtown with the city of Miami's northern neighborhoods. The preliminary plan calls for eventually reaching the city line at 87th Street, a distance of about 5 miles. A second line has been penciled in heading west along Calle Ocho through Little Havana to Coral Gables.

4.2.7 Heavy Rail

The following are some of the heavy rail projects being planned in Miami-Dade County under the People's Transportation Plan (PTP).

The North Corridor project extends along NW 27th Avenue, from Dr. Martin Luther King Jr. Metrorail Station (NW 62nd Street) to NW 215th Street (Miami-Dade/Broward County Line). The 9.5-mile long corridor has an estimated completion date for construction of 2012.

The Earlington Heights – MIC Connection project extends from the Earlington Heights Metrorail Station (NW 22nd Avenue) to the Miami Intermodal Center (north of NW 21st Street and east of NW 42nd Avenue). The total length is 2.2 miles, and the estimated completion date for construction is 2012.



RS&H	Miami-Dade MPO Metropolitan Planning Organization	Proposed Local Light Rail Transit	Figure 6

Although the transportation mode has yet to be determined, the East-West Multimodal Corridor project may have a heavy rail component. The corridor route consists of two segments. Segment I would be from Florida International University (FIU) to the Miami Intermodal Center (MIC); Segment II would be from the MIC to the Government Center in Downtown Miami. The lengths for Segment I and II are 10.5 miles and 4.4 miles, respectively. The estimated completion dates for construction for Segment I and II are 2013 and 2017, respectively.

The Northeast Multimodal Corridor's transportation mode has also has not been determined, but the project may include a heavy rail alternative. The corridor route is from Downtown Miami to the Broward County Line along Biscayne Boulevard and the Florida East Coast Corridor right-of-way. The length for the corridor is 13.6 miles, and the estimated completion date for construction is 2033.

Another project with an undetermined transportation mode is the Douglas Corridor. Future plans for this project call for a Metrorail extension from Douglas Road Station to the Miami Intermodal Center. The corridor length is 4.5 miles, and the estimated completion date for construction is 2033.

The maps for the planned rail systems are shown in Figure 7.

4.2.8 Monorail

There are no plans for a monorail system in Miami-Dade County.

Proposed Local Rail Service

Figure 7

5.0 NATIONAL RESEARCH

The following sections include a cursory review of existing and planned transit projects throughout the country for the various transit modes being evaluated.

5.1 EXISTING SYSTEMS

5.1.1 Enhanced Bus Services

The following table lists transit agencies in the United States that have similar characteristics compared to local Miami-Dade conditions. Typically, these bus transit systems have a fleet of 500-999 buses.

Table 2
Existing Bus Transit Systems

U.S. City	Transit Agency
Arlington Heights, IL	PACE (Pace Suburban Bus)
Atlanta, GA	MARTA (Metropolitan Atlanta Rapid Transit Authority)
Austin, TX	Capital Metro (Capital Metropolitan Transportation Authority, CMTA)
Baltimore, MD	MTA (Maryland Transit Administration)
Boston, MA	MBTA (Massachusetts Bay Transportation Authority)
Cleveland, OH	RTA (Greater Cleveland Regional Transit Authority)
Dallas, TX	DART (Dallas Area Rapid Transit Authority)
Detroit, MI	D-DOT (Detroit Department of Transportation)
Honolulu, HI	The Bus (City & County of Honolulu Department of Transportation Services)
Milwaukee, WI	MCTS (Milwaukee County Transit System)
Oakland, CA	AC Transit (Alameda-Contra Costa Transit District)
Orange, CA	OCTA (Orange County Transportation Authority)
Portland, OR	TriMet (Tri-County Metropolitan Transportation District of Oregon)
Saint Louis, MO	Metro (Bi-State Development Agency)
Salt Lake City, UT	UTA (Utah Transit Authority)
San Antonio, TX	VIA (VIA Metropolitan Transit)
San Francisco, CA	Muni (San Francisco Municipal Transportation Agency, San Francisco Municipal Railway)
San Jose, CA	VTA (Santa Clara Valley Transportation Authority)
Seattle, WA	Metro (King County Department of Transportation, KCDOT)

Several of the bus transit systems are highlighted below in more detail.

DART (Dallas Area Rapid Transit Authority)

DART is a regional transit agency created by voters and funded with a one-cent local sales tax. Currently, DART serves Dallas and 12 surrounding cities within a 700-square-mile area with approximately 130 bus routes. The fleet of nearly 800 buses is powered by either clean diesel or liquefied natural gas. The buses are equipped with comfortable seating, climate control systems designed for Texas heat, and high-tech features. DART also provides curb-to-curb services such as Call, a personalized demand-responsive transit service, and Paratransit Services, transportation for people with disabilities.

D-DOT (Detroit Department of Transportation)

The Detroit Department of Transportation (D-DOT) is the major bus transit carrier in Southeastern Michigan, as well as the largest transit carrier in the entire State of Michigan. The Department of Transportation's active fleet consists of 472 full-size and small buses including 25 CNG (Compressed Natural Gas) Rubber Wheeled Trolleys. During fiscal year 2002, D-DOT's annual passenger count totaled 39,769,169 and the annual passenger miles covered were 176,859,829. D-DOT serves the City of Detroit and over 20 suburban communities along 52 fixed-route bus lines. D-DOT carries approximately 80 percent of the region's bus passengers.

AC Transit (Alameda-Contra Costa Transit District)

The Alameda-Contra Costa Transit District is the third-largest public bus system in California, serving 13 cities and adjacent unincorporated areas in Alameda and Contra Costa counties. It has 105 bus lines, including 78 local lines within the East Bay and 27 Transbay lines to San Francisco and the peninsula. AC Transit buses stop at 6,500 bus stops and connect with 9 other public and private bus systems, 21 BART (Bay Area Rapid Transit) stations, 6 Amtrak stations, and 3 ferry terminals. Approximately, 1.5 million people live in AC Transit's 364 square mile service area.

TriMet (Tri-County Metropolitan Transportation District of Oregon)

TriMet is a municipal corporation providing public transportation for much of the three counties in the Portland, Oregon, metropolitan area. TriMet has 93 bus lines, with 80 connecting with the Metropolitan Area Express (MAX) light rail. The fleet of 638 buses also serves 18 major transit centers and the Portland Streetcar. TriMet has enhanced service and added convenience through:

- 16 frequent service bus lines
- Real-time arrival information
- 7,700 bus stops
- Technology to briefly hold a green light so a bus behind schedule can continue through a busy intersection
- More bus shelters
- Schedules provided at every bus stop

5.1.2 Trolley Bus Services

Only four cities in the United States use trolleybus service. These are:

- San Francisco, CA – Muni (San Francisco Municipal Transportation Agency, San Francisco Municipal Railway)
- Boston, MA – MBTA (Massachusetts Bay Transportation Authority)
- Dayton, OH – RTA (Greater Dayton Regional Transit Authority)
- Seattle, WA – Metro (King County Department of Transportation, KCDOT)

San Francisco has the largest trolley-bus fleet of any transit agency in the U.S. and Canada. San Francisco's trolley buses (as well as its streetcars and the cable motors for the cable cars) are almost entirely pollution-free, since their electric power comes from the city's hydroelectric Hetch Hetchy Water & Power Project. Muni's current fleet has 344 electric trolley buses that serve 16 routes.

Massachusetts Bay Transportation Authority (MBTA) formally launched into service new electric trolley buses (ETB's). Although the vehicles have a similar appearance to a standard, 40-foot bus, having rubber tires, and doors on the right hand side, the actual operating systems are more in line with a light rail vehicle. The new trolley buses, manufactured by Neoplan USA of Lamar, CO, have an alternating-current electric propulsion system, whereby power is provided to an electric motor through trolley poles attached to overhead wires. These vehicles also have modern accommodations improving the customer's commute, such as air conditioning, automatic stop announcements, and an onboard visual display depicting each stop.

Although some cities did start electric transit before Dayton, Ohio none have operated as continuously. The first electric trolley bus (ETB) operation in Ohio started in 1933, and the final conversion from rail to rubber-tired trackless trolleys took place in 1947. After voting to keep ETBs in 1991, the RTA made history in 1998 by unveiling the first production vehicle in its new ETB fleet, the first to be built in the U.S. in four decades.

5.1.3 Bus Rapid Transit

Boston's MBTA Silver Line, hailed as one of the nation's largest BRT examples to date, utilizes standard bus vehicles on a mix of shared-use and dedicated busways. The Silver Line is Boston's first Bus Rapid Transit service, and will join the Orange, Red, and Green Lines as the MBTA's fifth rapid transit line. The Silver Line operates in exclusive right-of-ways and uses advanced Intelligent Transportation System (ITS) technology.

This major MBTA capital investment is being introduced in three phases. Phase I is operating in a dedicated bus lane along Washington Street. The Silver Line's high-capacity 60-foot buses stop at rider-friendly stations in Roxbury, the South End, and Downtown. Along the route, passengers enjoy sheltered seating at Silver Line stations equipped with "smart kiosks", offering schedule information. In a little more than a year, Silver Line ridership nearly doubled, from 7,625 passengers a day to more than 14,000 daily.

Southern Nevada's Metropolitan Express (MAX) system is a hybrid between a bus and rail system. MAX has many features of rail service to make the transit experience quick, convenient, and hassle-free. Billed as a rapid transit system, MAX buses are semi-automated, using optically guided computers to run in a dedicated lane. Adding to the system's much-hyped swiftness is the bus's ability to extend the duration of green lights and bus stops where riders can buy passes at kiosks. The MAX route runs along Las Vegas Boulevard North, looping around near Craig Road to return to the Downtown Transportation Center.

5.1.4 Suspended/Cableway Trams

Domestically, only two such transit operations exist in New York, NY and at Mountain Village, CO. All other aerial tramways are at ski areas or at tourist sites.

The New York City Roosevelt Island Operating Corporation Island Aerial Tramway is a 120 passenger jig-back aerial tramway. Its original purpose was to cross the Hudson River and act as a temporary commuter connector between the residential community of Roosevelt Island and the New York City subway system until the subway could be extended in a tunnel under the Hudson River to the Island. This "temporary" aerial cableway has been in continuous operation for over 27 years transporting over 1.2 million passengers per year.

The Colorado Mountain Village Metropolitan District (MVMD) Gondola Transit System is an existing public transportation system now owned by a non-profit Metropolitan District. It is a unique, three section, 4-mile long, interconnected mono-cable gondola ACPM. Two sections of this ACPM connect the Town of Telluride, at a transit center with the central business district of the Town of Mountain Village; the third section of the system connects the central business district to a remote parking facility. It has been in operation continuously for eight years.

5.1.5 Automated Guideway Transit

The following cities in the United States have automated guideway transit systems:

- Detroit, MI – DTC (Detroit Transportation Corporation, Detroit People Mover)
- Indianapolis, IN – CPM (Clarian People Mover)
- Jacksonville, FL – JTA (Jacksonville Transportation Authority)
- New York, NY – ATJFK (AirTran JFK)
- Newark, NJ – ATN (AirTran Newark)

The Detroit Transportation Corporation, City of Detroit, is owner and operator of the Detroit People Mover. The Detroit People Mover (DPM) is a fully-automated light rail system that operates on an elevated single track loop in Detroit's central business district. The system provides connections between the courts and administrative offices of several levels of government, sports arenas, exhibition centers, major hotels, and commercial, banking, and retail districts. Service is frequent, unencumbered by vehicle or pedestrian traffic, and conveniently available throughout the central business district. The integration of eight of the thirteen People Mover stations into pre-existing structures links over 9 million square feet that can be traversed unimpeded by outside elements. The DTC fleet consists of twelve driver-less vehicles that are fully automated and computer controlled.

The JTA's 2.5-mile Skyway is an automated transit system operating on an elevated dual guideway. Ten two-car trains whisk patrons to both sides of the St. Johns River in the central business district six days a week and for special events. There are three end stations – Florida Community College of Jacksonville (FCCJ), Convention Center and Kings Avenue – are intermodal with extensive parking and transfer points for bus and Park-n-Ride patrons.

The Clarian People Mover officially came to life on April 24, 2000 when the Indianapolis City Council granted Clarian Health Partners a nonexclusive franchise agreement to construct, operate and maintain the transportation system. Now, three years later, Clarian's People Mover can be seen gliding along its guideways, whisking passengers from station to station. The People Mover is the only privately funded public rail system in the nation that runs over public streets. Each People Mover train can carry more than 80 passengers and travels up to 30 mph.

5.1.6 Light Rail Transit

The following table lists U.S cities that have light rail transit systems in place:

Table 3
Existing Light Rail Transit

U.S. City	Transit Agency
Baltimore, MD	MTA (Maryland Transit Administration)
Boston, MA	MBTA (Massachusetts Bay Transportation Authority)
Buffalo, NY	Metro (Niagara Frontier Transit Metro System)
Cleveland, OH	RTA (Greater Cleveland Regional Transit Authority)
Dallas, TX	DART (Dallas Area Rapid Transit Authority)
Denver, CO	RTD (Regional Transportation District)
Houston, TX	Metro (Metropolitan Transit Authority of Harris County)
Los Angeles, CA	MTA (Los Angeles County Metropolitan Transport Authority)
Minneapolis, MN	Metro Transit (MT)
Newark, NJ	NJT and NJT River LINE (New Jersey Transit Corporation)
Philadelphia, PA	SEPTA (Southeastern Pennsylvania Transportation Authority)
Pittsburgh, PA	PAAC (Port Authority of Allegheny County)
Portland, OR	Portland Streetcar (PS); TriMet (Tri-County Metropolitan Transportation District of Oregon)
Sacramento, CA	SRTD (Sacramento Regional Transit District)
Saint Louis, MO	Metro (Bi-State Development Agency)
Salt Lake City, UT	UTA (Utah Transit Authority)
San Diego, CA	SDT (San Diego Trolley)
San Francisco, CA	Muni (San Francisco Municipal Transportation Agency, San Francisco Municipal Railway)
San Jose, CA	VTA (Santa Clara Valley Transportation Authority)
Tacoma, WA	Sound Transit (Central Puget Sound Regional Transit Authority)
Tampa, FL	TECO Line Streetcar System

TriMet's 33-mile Metropolitan Area Express (MAX) light rail system connects the cities of Portland, Gresham, Beaverton and Hillsboro, and the Portland International Airport in Oregon. MAX has 64 stations and provides 31% of weekday transit trips. MAX is part of an integrated light rail and bus system that serves the urbanized portion of the three counties in the Portland metropolitan area. Light rail is a catalyst for creating transit-oriented developments near transit stations. MAX lines were within the federal government's full funding grant agreement. MAX connects residential neighborhoods with major employment centers, regional shopping and entertainment facilities.

Tacoma's brand-new light rail transit streetcar (what Europeans call a tram), at just 1.6 miles in length through Downtown Tacoma, Tacoma Link is by far the shortest modern LRT system yet installed in a North American city. Its $80.4-million cost was steep; it was built to eventually accommodate the much heavier trains of Sound Transit's regional Link interurban LRT system. Free parking is located at the Tacoma Dome Station. The station was designed to keep cars out of the downtown area. A major factor of its success seems to be the convenience of not having to fight for a scarce parking. The new Link LRT service enables many downtown workers, who can't afford to pay for expensive monthly off-street parking, to park in a remote location (Tacoma Dome) and get to their offices, rather than to park on the street. Other factors include comfortable, spacious vehicles, a fast, quiet, and smooth ride, a well-defined, clearly understandable route, well-defined stations with useful amenities, and an ambiance of reliability and safety. Another critical objective of the Link has been to stimulate vigorous real estate development and contribute to the ongoing revitalization of Downtown Tacoma.

Tampa's TECO Line Streetcar System is a 2.4-mile single-track system operating seven days a week from mid-morning until late evening, later on weekends. The eight-car system uses air-conditioned replicas of the Birney Safety cars that originally ran in Tampa until 1946. Construction of the system was a joint venture between the City of Tampa and Hillsborough Area Regional Transit Authority. Total cost for the 2.4 miles of track, vehicles and stations was approximately $32 million. Related structures and property purchases raised the overall cost to $56 million. The success of Tampa's streetcar system can be traced to the cooperation between the City of Tampa and Hillsborough Area Regional Transit Authority to implement the system, the hard work of Tampa Historic Streetcar, Inc. which is the non-profit corporation created to manage the system, the Metropolitan Planning Organization's support through prioritization of federal funds used in part to fund the system, and the support of the local business community. The Florida Department of Transportation and Federal Transit Administration contributed not only funding, but also knowledge and effort that make them full partners.

5.1.7 Heavy Rail

The following table lists existing heavy rail systems in the United States outside of Miami:

Table 4
Existing Heavy Rail Transit

U.S. City	Transit Agency
Atlanta, GA	MARTA (Metropolitan Atlanta Rapid Transit Authority)
Baltimore, MD	MTA (Maryland Transit Administration)
Boston, MA	MBTA (Massachusetts Bay Transportation Authority)
Chicago, IL	CTA (Chicago Transit Authority)
Cleveland, OH	RTA (Greater Cleveland Regional Transit Authority)
Jersey City, NJ	PATH (Port Authority Trans-Hudson)
Lindenwold, NJ	PATCO (Port Authority Transit Corporation of PA-NJ)
Los Angeles, CA	MTA (Los Angeles County Metropolitan Transportation Authority)
New York, NY	NYCT (MTA New York City Transit); SIR (MTA Staten Island Railway)
Oakland, CA	BART (San Francisco Bay Area Rapid Transit District)
Philadelphia, PA	SEPTA (Southeastern Pennsylvania Transportation Authority)
Washington, DC	Metro (Washington Metropolitan Area Transit Authority)

Atlanta's MARTA is the ninth largest transit system in the U.S. and North America that provides bus, rail and paratransit service. Operating 350 rail cars in 38 stations on 47.6 miles of rail, approximately 31.6 miles of the nearly 48-mile rail system are located in Fulton County, with 14.7 miles in DeKalb County and 7 miles (to the Airport) in Clayton County. MARTA is the first transit agency to provide direct access to a major airline (Delta) in one of its 38 rail stations.

Baltimore's MTA's Metro service operates on a single line from Owings Mills to Johns Hopkins Hospital. Metro opened for service in November 1983, serving 9 stations from Charles Center to Reisterstown Plaza. It extended to Owings Mills (adding 3 stations) in July 1987. The extension from Charles Center to Johns Hopkins Hospital opened in May 1995. The line is now 15.5 miles long and serves 14 stations. The Metro fleet consists of 100 heavy-rail cars in 50 married pairs (Metro cars must be connected in pairs to function, a minimum of two cars, and a maximum length, which can be berthed in a station of six cars). The cars have standard railroad "tracks" and are powered by a collector shoe, which draws power from the "third" rail.

The CTA is an independent governmental agency created by Illinois State legislation. The CTA operates the nation's second largest public transportation system and covers the City of Chicago and 40 surrounding suburbs. CTA's 1,190 rapid transit cars operate over seven routes and 222 miles of track. CTA trains provide about 500,000 customer trips each day and serve 144 stations. Chicago is one of the few cities in the world that provides rapid transit service to two major airports, O'Hare International Airport and Midway Airport.

5.1.8 Monorail

Besides recreational monorail lines in resorts, amusement parks, and similar venues, only Seattle, Washington and Jacksonville, Florida have actual monorails that have been deployed in an urban revenue-service setting – and, so far, only in very short circulator or shuttle applications. The most recent addition is the Las Vegas Monorail, where Phase I is already in service.

Phase I of the Las Vegas Monorail is approximately 4 miles long with 7 stations. It operates between the MGM Grand and Sahara Hotel and Casino. The entire route can be traveled end to end in approximately 14 minutes. Phase I is owned and operated by the Las Vegas Monorail Company, a non-profit corporation whose board is appointed by the Governor of Nevada. It is 100% privately financed. A $650 million financing plan was developed locally with support from hotel resorts, investors, contractors and the system operator.

In 1962, Seattle built it's the first full-scale monorail system in the country, in time for the Seattle "Century 21" World's Fair. The 1.2-mile monorail, which was built in just 10 months for a cost of $3.5 million, was designed to whisk fair-goers between downtown and Seattle Center, thus avoiding parking and traffic problems at the Center. The monorail proved an instant hit. It carried nearly 8 million riders in its first six months and earned back its construction costs in just five months. Residents and visitors alike lined up to ride the sleek, futuristic trains, thrilling at the expansive views of downtown and the mountains as they raced above the streets. Today, 2.5 million passengers a year ride the monorail's original train cars from Westlake Center through the Experience Music Project to Seattle Center and back. Owned by the City of Seattle and operated by a locally owned, private company, it remains one of the only publicly owned transit systems in the U.S. to operate at a profit.

5.2 PROPOSED CONCEPTS

5.2.1 Enhanced Bus Services

Under Tri-Met's Transit Investment Plan (TIP), two of the priorities that have been set to help meet regional transportation and livability goals are to:

- Expand Frequent Service by adding routes to TriMet's network of bus lines than run every 15 minutes or better, every day.
- Improve local service by working with local jurisdictions to improve transit service in specific local areas.

By 2005, the following should be in place:

- Begin Frequent Service on Line 57-TV Hwy/Forest Grove.
- Complete Intergovernmental Agreement for TV Highway pedestrian and transit stop improvements
- Evaluate pedestrian environment on Line 76-Beaverton/Tualatin
- Continue installation of Traffic Signal Priority on Frequent Service lines within the City of Portland
- Improve local routes in Tigard along SW Bonita Rd. and SW 72nd Ave.
- Improve service along NE 181st/SE 182nd Avenues
- Begin Hillsboro Shuttle for seniors and people with disabilities.
- Begin weekend shuttle to Blue Lake Park for Summer 2005

The following improvements are projected to be completed during 2006-09

- Begin Frequent Service on Line 76-Beaverton/Tualatin
- Route Lines 35-Macadam and possibly Line 40-Tacoma through South Waterfront neighborhood
- Coordinate North Clackamas bus service with I-205 Light Rail

5.2.2 Trolley Bus Services

Domestically, there are no proposed Trolley Bus Services being proposed. However, San Francisco's MUNI is looking at plans to connect some diesel lines to electric trolley buses.

5.2.3 Bus Rapid Transit

Boston's MBTA Silver Line Phase II, connecting South Station and the South Boston Waterfront via an exclusive, underground tunnel, will begin operating in 2004. Silver Line Phase III, linking Downtown and South Station, is slated for completion by mid-2010. In the future, it will enter a tunnel in Downtown and continue to Boylston Street, Chinatown, and South Station. From South Station, it will proceed to the South Boston Waterfront, stopping at Courthouse Station, World Trade Center Station, the Boston Convention & Exhibition Center, Marine Industrial Park, and Logan Airport.

Over the next few years, transit planners are looking at an expansion of the Southern Nevada MAX network. Future MAX routes are expected along Boulder Highway, Rancho Drive, Flamingo Road, Charleston Boulevard and Tropicana and Sahara avenues.

5.2.4 Suspended/Cableway Trams

In Utah, the City of Ogden is studying a Transit Corridor between the Ogden Intermodal Transit Hub, the City Center Mall and the Weber State University campus. The City of

Ogden, Utah is funding it, under an agreement with the MPO, the Wasatch Front Regional Council (WFRC) and the Utah Transit Authority (UTA). Ogden is undertaking this Feasibility Study for an Aerial Cableway System as one transportation alternative, along with light rail and rubber tire, to connect the Webber State University campus and the new Downtown Mall with the Hub. The route is 4 to 5 miles with 3 to 4 stations.

In New Jersey, a Feasibility Study has been commissioned to connect the A.C. (Atlantic City) Convention Center and Rail Station to the Boardwalk, Caesars Pier and central parking structure, using an ACPM cableway gondola system exclusively. Atlantic City is a heavily visited tourist destination, with over 35 million visitors annually. The route is approximately 0.8 mile with 4 stations.

5.2.5 Automated Guideway Transit

In Las Colinas, Texas Phase I of the People Mover system has been constructed. It consists of a 1.4-mile dual lane guideway that includes 4 stations. The long-term plan called for a total of 5 miles of dual lane guideway and 20 stations. The four vehicles that operated during Phase I could carry 45 passengers comfortably, 33 standing and 12 seated. The cost of Phase I is reported to be $45 million which included 5 years of operation and maintenance by the vendor. The Phase I line opened in 1989 and has not been extended. This system was shut down in July 1993 for 3 years and 4 months. Limited operations were resumed in December 1996 during weekday lunch hours.

5.2.6 Light Rail Transit

The following table lists light rail transit systems being proposed throughout the U.S.:

Table 5
Proposed Light Rail Transit

U.S. City	Transit Agency
Aspen, CO	EAP (City of Aspen Entrance to Aspen Project)
Austin, TX	ASG (Capital Metropolitan Transportation Authority All Systems Go! Project)
Bangor, ME	BTTAS (Bangor to Trenton Transportation Alternatives Study)
Birmingham, AL	BRTAA (Birmingham Regional Transportation Alternatives Analysis)
Charleston, SC	CARTA (Charleston Area Regional Transportation Authority)
Charlotte, NC	CATS (Charlotte Area Transit System)
Chicago, IL	CTA (Chicago Transit Authority)
Cincinnati, OH	SORTA (Southwest Ohio Regional Transit Authority)
Columbus, OH	Fast Trax (Central Ohio Transit Authority)
Corpus Christi, TX	The B (Corpus Christi Regional Transportation Authority, CCRTA)
Detroit, MI	DDMA (Downtown Detroit to Metro Airport Rapid Transit Alternative Analysis Study)
El Paso, TX	SMART (Sun Metro Area Rapid Transit Line)
Fort Worth, TX	FWTA (Fort Worth Transportation Authority)
Grand Canyon, AZ	GCT (Grand Canyon Transit)
Jacksonville, FL	JTA (Jacksonville Transportation Authority Transportation Alternatives Analysis)
Los Angeles, CA	F4ET (Friends 4 Expo Transit); MGLCA (Metro Gold Line Construction Authority)
Louisville, KY	T^2 (Transportation Tomorrow)
Madison, WI	T2020 (Transport 2020)
Milwaukee, WI	MCTS (Milwaukee County Transit System)
Minneapolis, MN	Central Corridor (CC); MNDOT (Minnesota Department of Transportation Light Rail)
New York, NY	Vision42
Norfolk, VA	NLRP (Norfolk Light Rail Project)
Oceanside, CA	NCTD (North County Transit Direct)
Orange, CA	OCTA (Orange County Transportation Authority)
Orlando, FL	CFR (Central Florida Rail)
Phoenix, AZ	Valley Metro Rail (Central Phoenix/East Valley Light Rail Project)
Raleigh, NC	TTA (Triangle Transit Authority)
Richmond, VA	GRTC (GRTC Transit System)
Rochester, NY	RRTC (Rochester Rail Transit Committee)
San Antonio, TX	VIA (VIA Metropolitan Transit)
Seattle, WA	Sound Transit (Central Puget Sound Regional Transit Authority)
Spokane, WA	SRLR (Spokane Regional Light Rail)
Tampa, FL	Hartline (Hillsborough Area Regional Transit Authority)
Tucson, AZ	TST (Tucsonans for Sensible Transportation)
Washington, DC	Metro (Washington Metropolitan Area Transit Authority)

There are planned extensions for the TECO Line Streetcar System, which would extend the system through the core of downtown Tampa, from the Southern Transportation Plaza north to downtown Tampa's planned Cultural Arts District. Future extensions could also connect the system to the Tampa Heights neighborhood, back to Ybor City, and the Hyde Park neighborhood. The final alignments are yet to be determined by environmental studies of alternatives based on social, economic and environmental factors. HART is seeking funding for Phase IIa to extend the system north to Whiting Street in downtown Tampa. The Streetcar Phase II Steering committee unanimously voted to focus study on Ashley Drive and Franklin Street. The next phase of the system will be a 1/3 mile extension that will run north on Franklin Street to Whiting Street and the Fort Brooke parking garage. It will connect the more than 35,000 people who work in the downtown area to almost every major downtown parking structure.

Through 2014, the DART Rail System is slated to more than double in size to 93 miles. Extensions now in development include the 17.5-mile Northwest Corridor serving downtown Dallas, American Airlines Center, the Dallas Medical/Market Center, Love Field Airport, and the cities of Farmers Branch and Carrollton. A 13-mile branch will extend from the Northwest Corridor to North Irving's Las Colinas Urban Center and DFW International Airport. Another 10.2-mile extension will serve the Southeast Corridor connecting downtown Dallas, Deep Ellum, Fair Park, South Dallas and Pleasant Grove.

5.2.7 Heavy Rail

There are no new heavy rail projects currently being planned in the U.S.

5.2.8 Monorail

A Final Environmental Impact Statement is now being prepared for the Downtown Extension (Phase 2A) component of the Las Vegas Monorail, which is 2.3 miles and 4 stations. The Spur Extension, another line, represents a 0.8 mile, 1-station extension of the Resort Corridor Fixed Guideway Monorail System from the Las Vegas Hilton to a station at Las Vegas Boulevard South at the entrance driveways to the Riviera Hotel and Stardust Hotel. The Spur Extension will connect with the Phase 1 and Phase 2A Monorail System (a total 5.9 miles and 11 stations). It will provide a seamless operation between the Riviera/Stardust station area and the Fremont Street station in downtown Las Vegas. The Spur Extension will also provide a major bus and pedestrian interface at the Riviera/Stardust station for RTC Strip buses.

In November 2002, Seattle voters approved a petition to fund the building of the 14-mile Monorail Green Line, "Phase I" of a proposed 5-line citywide monorail system. The Green Line will connect Ballard, Key Arena, Seattle Center, Belltown, Downtown, Pike Place Market, Benaroya Hall, the ferry terminal, Pioneer Square, the Chinatown-International District, King Street Station, SODO, Safeco Field, the Seahawks Stadium and West Seattle. The Green Line will carry millions of people each year, above traffic with easy connections to buses, ferries, light rail and trains. The Seattle Popular Monorail Authority (Seattle Monorail Project) is an independent city transportation authority established under state law, charged with building, owning, operating and maintaining the monorail system. The project is on track to break ground fall of 2004, with the entire line scheduled to be operational in summer of 2009.

6.0 INTERNATIONAL EFFORTS

6.1 Enhanced Bus Services

The bus network in London is one of the largest and most comprehensive urban transport systems in the world. Every weekday over 6,500 scheduled buses carry around 5.4 million passengers on over 700 different routes, amounting to over 1.5 billion passengers a year. London Buses manages one of the world's largest urban bus networks, and is the largest public transport provider in the UK by passengers carried. London Buses is the major contributor to the Government's 10-year transport plan, which includes the target "to increase bus use in England (passenger journeys) from 2000 levels by 10% by 2010, while at the same time securing improvements in punctuality and reliability."

6.2 Trolley Bus Services

Edmonton and Vancouver are the only 2 Canadian cities that operate a small number of trolley bus routes. Presently, Edmonton Transit System (ETS) assigns its Brown Boveri (BBC) trolley buses to seven of its core routes where there is an established network of overhead wire. Trolley bus operations in Edmonton began in 1939. There is a current fleet of 98 trolley buses, serving 7 routes. Eltec maintains the trolley overhead system for ETS.

6.3 Bus Rapid Transit

BRT as a comprehensive transportation option is exemplified in Curitiba, Brazil. Curitiba's Bus Rapid Transit system uses low-floored articulated buses on exclusive roadways, coupled with intensive supportive land-use development patterns along its corridors. It is an extensive commuter bus system that includes exclusive busways and a number of other features designed to increase speed, such as traffic signal prioritization, rail-like stations with level-floor boarding, and advance fare collection.

6.4 Suspended/Cableway Trams

Many studies have been undertaken over the years for ACPM Aerial Cableway Systems as public transportation in Europe, South America, and Asia. Some examples of such implemented aerial cableway systems are as follows:

- Medellin, Columbia – ACPM 8-passenger gondola connecting the upper and lower sections of the City with the railroad station on the opposite side of the river
- Bara Sul, Brazil – Mono-cable 8-passenger gondola tramway crossing over an ocean inlet and connecting the commercial and hotel area of the Resort with a provincial park and beaches
- Caracas, Venezuela – Mono-cable 8-passenger gondola crossing over a mountain and connecting the city to a hotel complex and beach area
- Hong Kong, China – Various mono-cable gondolas, bi-cable gondolas and aerial tramways providing access from transit centers to museums, theme parks, regional parks and area attractions
- Japan – Numerous aerial cableway ACPM's connecting transit centers to regional parks, theme parks and area attractions
- Taejon, Korea – Mono-cable 6-passenger gondola used for the 1988 World's Fair and still in operation as a tourist attraction and people mover
- Genting Highlands, Malaysia – Mono-cable 8-passenger gondola originating in the hotel lobby and transporting passengers to a theme park, entertainment and casino complex
- Singapore, Malaysia – Two mono-cable 8-passenger gondolas providing sightseeing access to various points in the City
- Cairns, Australia – 5-mile long mono-cable 6-passenger cableway that passes through the rainforest stopping at interpretive nature centers and terminating at a native village and train station
- Europe – Numerous examples, in operation, of all the various types of ACPM cableway systems

6.5 Automated Guideway Transit

The Tokyo Teleport Town has been developed along the edge of Tokyo Bay as part of an effort to convert the urban structure of Tokyo to a multi-centered urban form as opposed to its current monocentric form. To serve this Teleport Town, a transit system was constructed, beginning in 1989. It was opened for service in 1995. It runs along the waterfront zone and is said to have carried about 29,000 passengers per day at the beginning, rising to around 43,000 in 1996. It is 12-km in length, has 12 stations and takes 24 minutes to travel from one end to the other.

6.6 Light Rail Transit

Vancouver's regional government voted in May 2003 to replace the 98-B, greater Vancouver's premier Bus Rapid Transit line, with a rail line, the city's third, by 2010. Currently, the 98-B runs for 10 miles: from downtown Vancouver, past the airport to Richmond, an emerging suburban center. However, from the start, Vancouver transit officials had billed BRT not as an alternative to rail, but as a step toward it.

Since opening in 1987, the Docklands Light Railway (DLR) has been central in the regeneration of East London, UK, and continues to expand in all directions. In April 1997, operations and maintenance passed into the private sector. DLR Ltd. is a holding company and part of the new Transport for London (TfL) organization, while Serco Docklands holds the current operating and maintenance franchise for the system. An extension of the Docklands Light Railway to London's City Airport has won government support and construction started in March 2003. It involves a branch from Canning Town interchange to King George V in North Woolwich, comprising ground level sections and sections on embankment and viaduct. The major sources of traffic on the new line will be London City Airport and the Royal Docks redevelopment. A further extension from North Woolwich under the River Thames to Woolwich Arsenal is also at the public consultation stage, with four routes being considered. The success of the network is in helping to regenerate east London and the Docklands is prompting DLR and TfL to examine more extensions.

Over the past 23 years, the CTrain has become the backbone of the Calgary Transit system and is widely regarded as one of the most successful LRT systems in the world. The present Ctrain system encompasses 35.4 km of track, 34 stations, 11,000 park and ride stalls, 116 Ctrain cars, and carries over 200,000 passengers each weekday. Planning for Calgary's future LRT needs has been updated and refined through a series of functional planning studies and community plans that have been undertaken since the early 1970's. These studies have identified that a network of six LRT lines will be necessary to accommodate a future city population of 1.5 million. The approved components of the future LRT network have been incorporated in the Calgary Transportation Plan. The route and functional planning for all components of the future LRT has yet to be completed; however, future plans include extensions of existing LRT lines to Rocky Ridge/Tuscany, south of Marquis of Lorne Trail and north of 96 Avenue NE. As well, new LRT lines are required to serve the west, north-central and southeast areas of Calgary. It is envisaged that the future LRT system will encompass approximately 112 km of track, 72 stations, 22,000 park and ride stalls, a downtown subway and a fleet of 325 CTrains.

6.7 Heavy Rail

Puerto Rico's largest infrastructure project, a 11-mile metropolitan rapid-transit system known as the Tren Urbano, is North America's first comprehensive turnkey transit project. The rail line will serve the most densely populated corridor of the island, linking the central business district to residential and employment areas in San Juan and neighboring communities. Phase I connects Bayamon, Guaynabo, and San Juan's Rio Piedras, Hato Rey, and Santurce sectors. Future construction phases will extend the system to the Minillas Government Center in Santurce, the municipality of Carolina, Luis Munoz Marin International Airport in Isla Verde, Old San Juan, and Caguas. This system will use electric trains that can cruise 55 miles an hour on dedicated guideways. The majority of Phase I route is elevated, one long section is at ground level, and another underground. There will be 16 passenger stations strategically located in commercial and residential areas with the highest population density and greatest traffic congestion. Estimated project cost of Phase I is $1.67 billion. The system will have a total of 74 vehicles.

6.8 Monorail

Metropolitan Osaka is the second largest city in Japan and is considered the center of economy and culture. Rail lines emanate from the center of the city to surrounding areas. The Osaka monorail is being built to connect with these outer communities with a half circle system, which will eventually surround the city with over 50-km of track. The first 6.6-km segment opened in 1990 north of Osaka. The system now begins at the Osaka domestic airport, heads east along a freeway, then turns south with the freeway and crosses a dramatic new arched bridge built exclusively for the monorail. Construction has also begun on a spur line, which will connect to a university and a new community being built from scratch with the new monorail corridor in mind.

The first revenue passenger service "H-Bahn" opened at Dortmund University in 1984. The initial line was only 1-km long but connected two segments of the University separated by a valley and a major roadway. The system was so popular with students and faculty that more than five million passengers had been carried by 1991 (in complete safety). With this success came backing for extensions. Additional track was added at both the south and north end. A spur line and switch was added which allows passengers to transfer to the city subway system directly below a monorail station. A new 1.2-km line is currently being added to a nearby science park. Top speed of the vehicles is 65 kph.

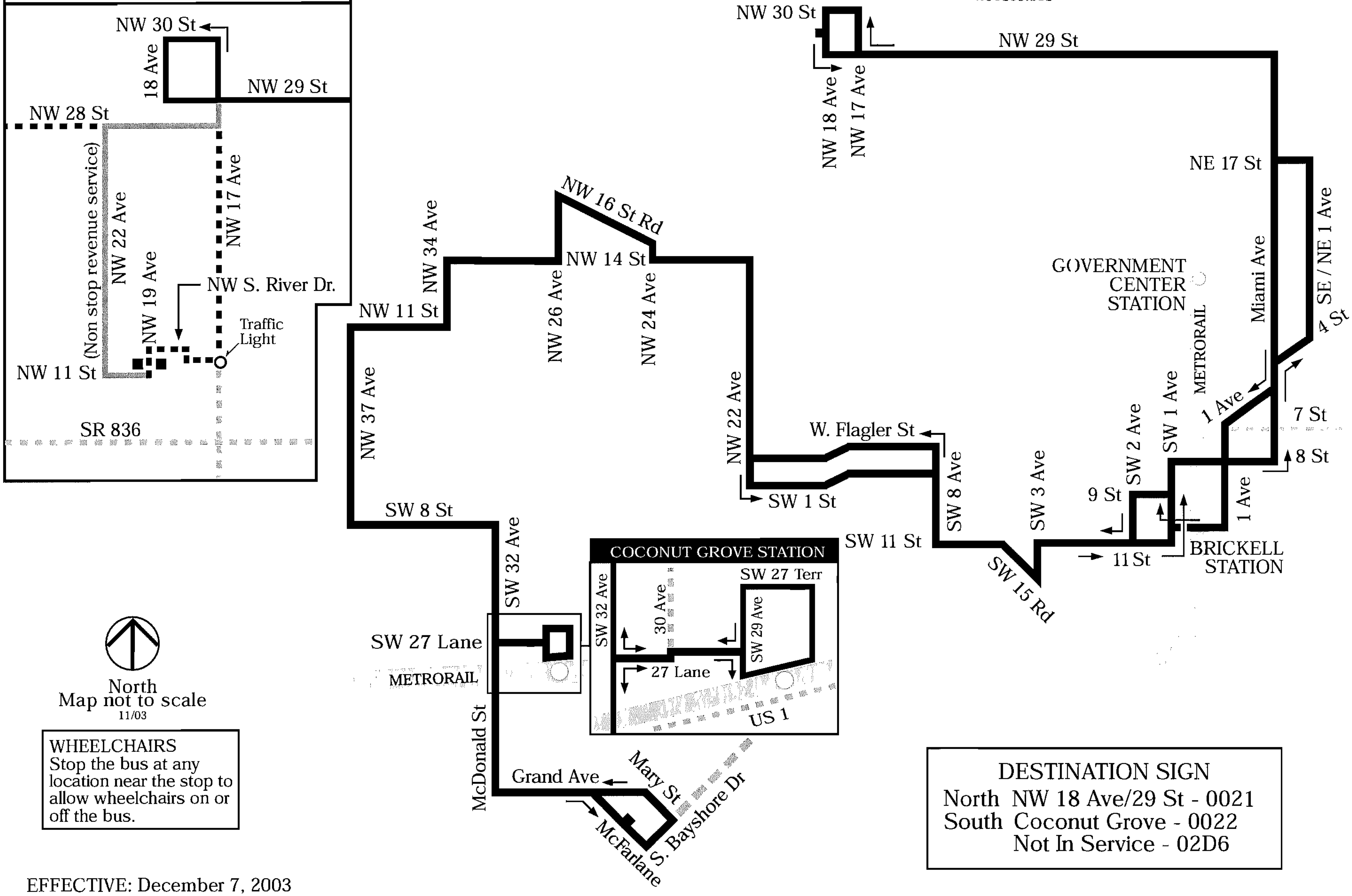
APPENDIX A
EXISTING LOCAL BUS ROUTES

Route 6

ALL BUSES ARE WHEELCHAIR ACCESSIBLE

BIKE ACCESSIBLE

Deadhead
Non stop revenue service
One A.M. Southbound trip and one P.M. Northbound trip will serve bus stop at NW 19 Ave/12 St. See schedule.



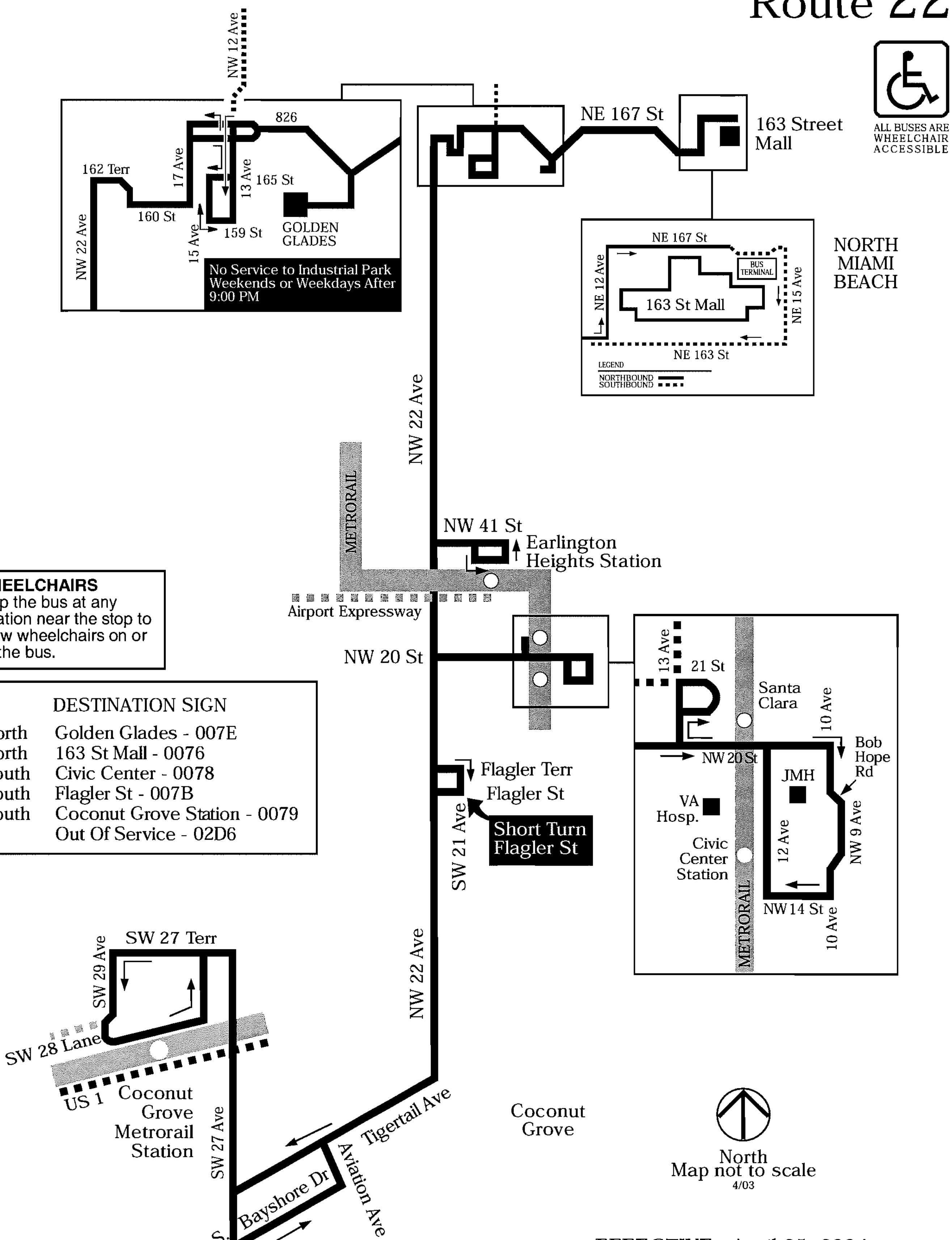
Map not to scale
11/03

WHEELCHAIRS
Stop the bus at any location near the stop to allow wheelchairs on or off the bus.

DESTINATION SIGN
North NW 18 Ave/29 St - 0021
South Coconut Grove - 0022
Not In Service - 02D6

EFFECTIVE: December 7, 2003

Route 22



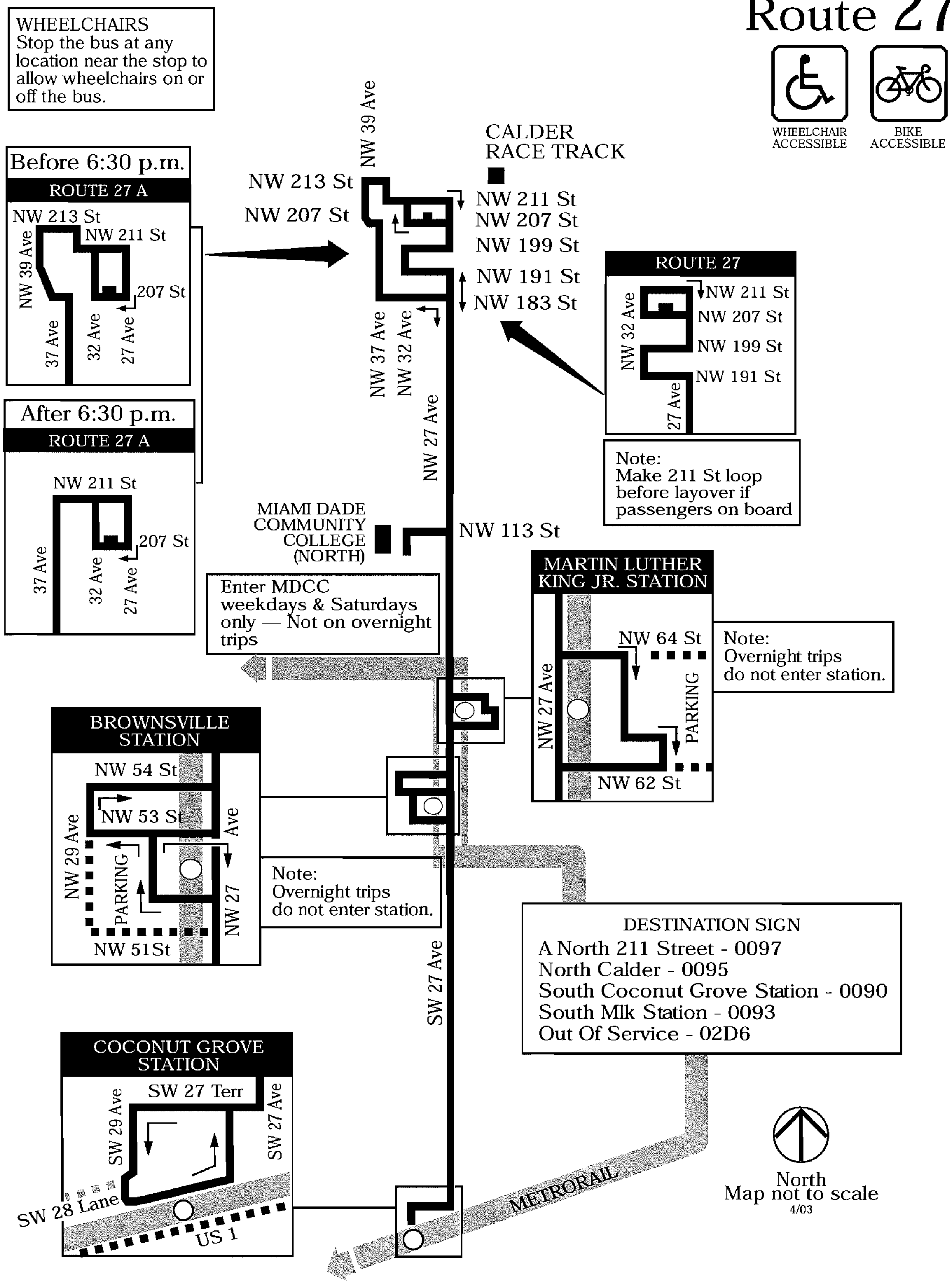
WHEELCHAIRS
Stop the bus at any location near the stop to allow wheelchairs on or off the bus.

DESTINATION SIGN

North	Golden Glades - 007E
North	163 St Mall - 0076
South	Civic Center - 0078
South	Flagler St - 007B
South	Coconut Grove Station - 0079
	Out Of Service - 02D6

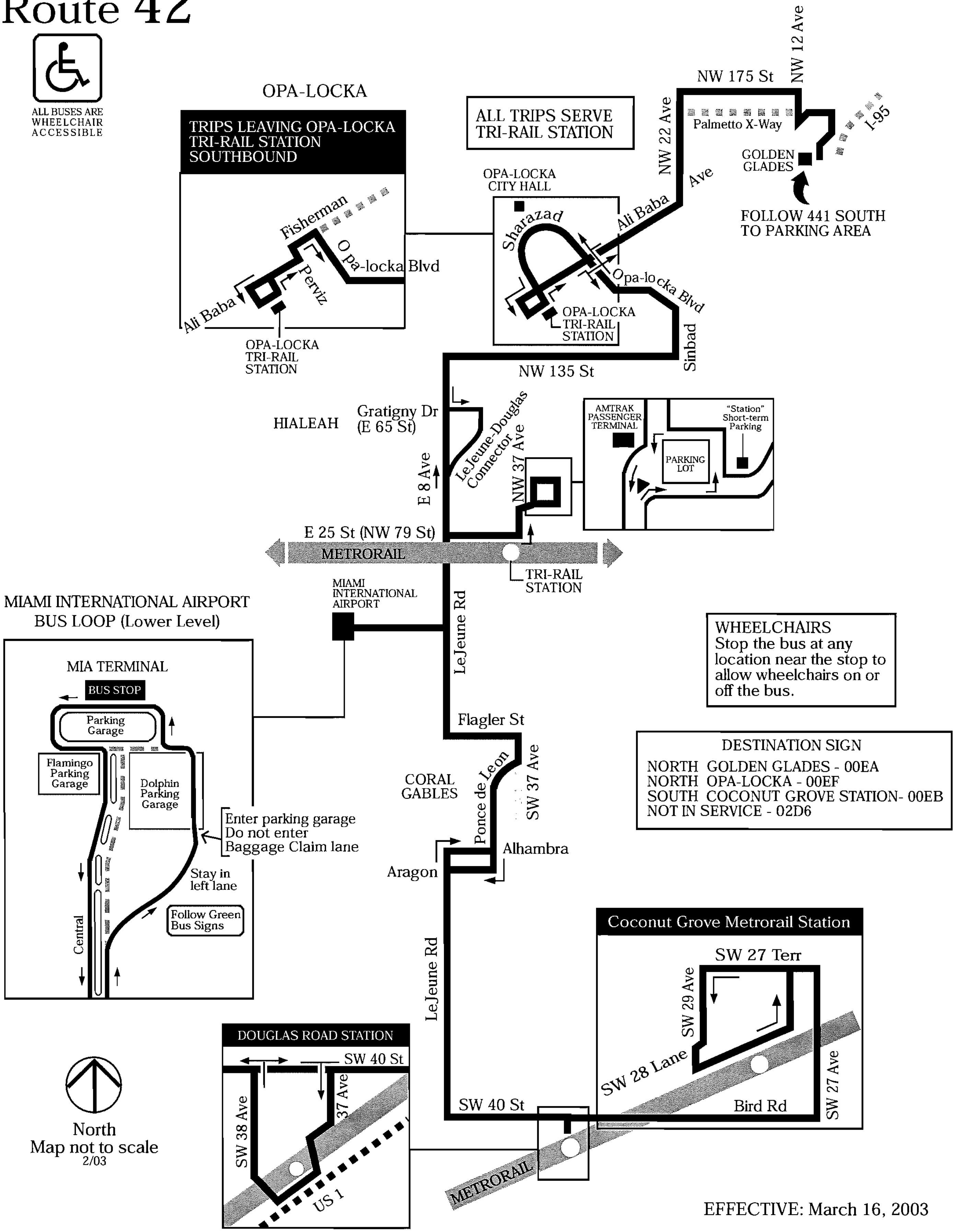
EFFECTIVE: April 25, 2004
CORRECTED:

Route 27



EFFECTIVE: April 25, 2004

Route 42

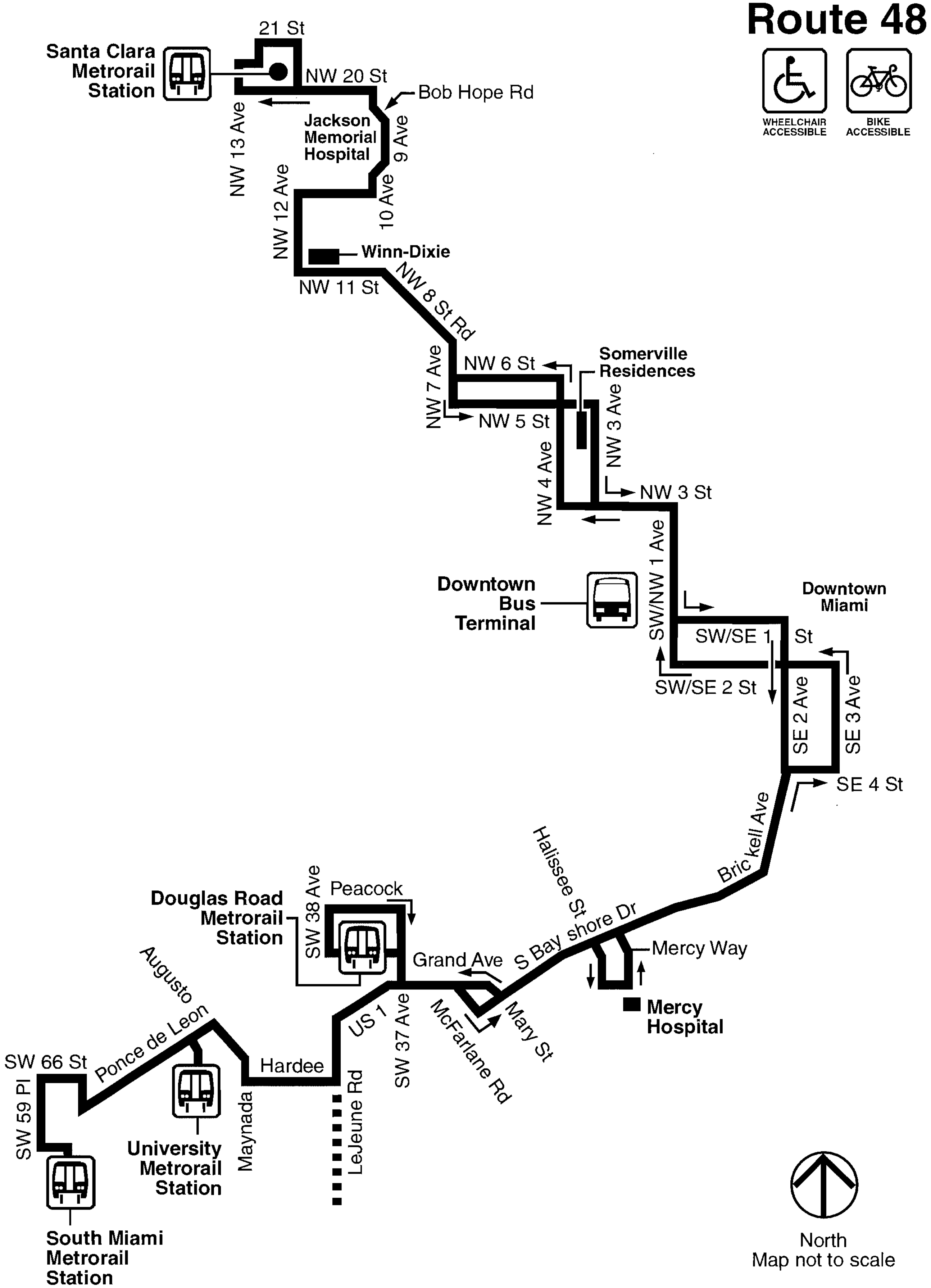


WHEELCHAIRS
Stop the bus at any location near the stop to allow wheelchairs on or off the bus.

DESTINATION SIGN
NORTH GOLDEN GLADES - 00EA
NORTH OPA-LOCKA - 00EF
SOUTH COCONUT GROVE STATION- 00EB
NOT IN SERVICE - 02D6

EFFECTIVE: March 16, 2003

Route 48


WHEELCHAIR ACCESSIBLE
BIKE ACCESSIBLE
21 St
Santa Clara Metrorail Station
NW 20 St
Bob Hope Rd
NW 13 Ave
Jackson Memorial Hospital
9 Ave
10 Ave
NW 12 Ave
Winn-Dixie
NW 11 St
NW 8 St Rd
NW 7 Ave
NW 6 St
Somerville Residences
NW 5 St
NW 3 Ave
NW 4 Ave
NW 3 St
SW/NW 1 Ave
Downtown Bus Terminal
Downtown Miami
SW/SE 1 St
SW/SE 2 St
SE 2 Ave
SE 3 Ave
SE 4 St
Brickell Ave
Halissee St
S Bayshore Dr
Mercy Way
Mercy Hospital
Douglas Road Metrorail Station
SW 38 Ave
Peacock
Grand Ave
Mary St
McFarlane Rd
SW 37 Ave
US 1
Augusto
Ponce de Leon
Hardee
LeJeune Rd
Maynada
University Metrorail Station
SW 66 St
SW 59 Pl
South Miami Metrorail Station
North
Map not to scale

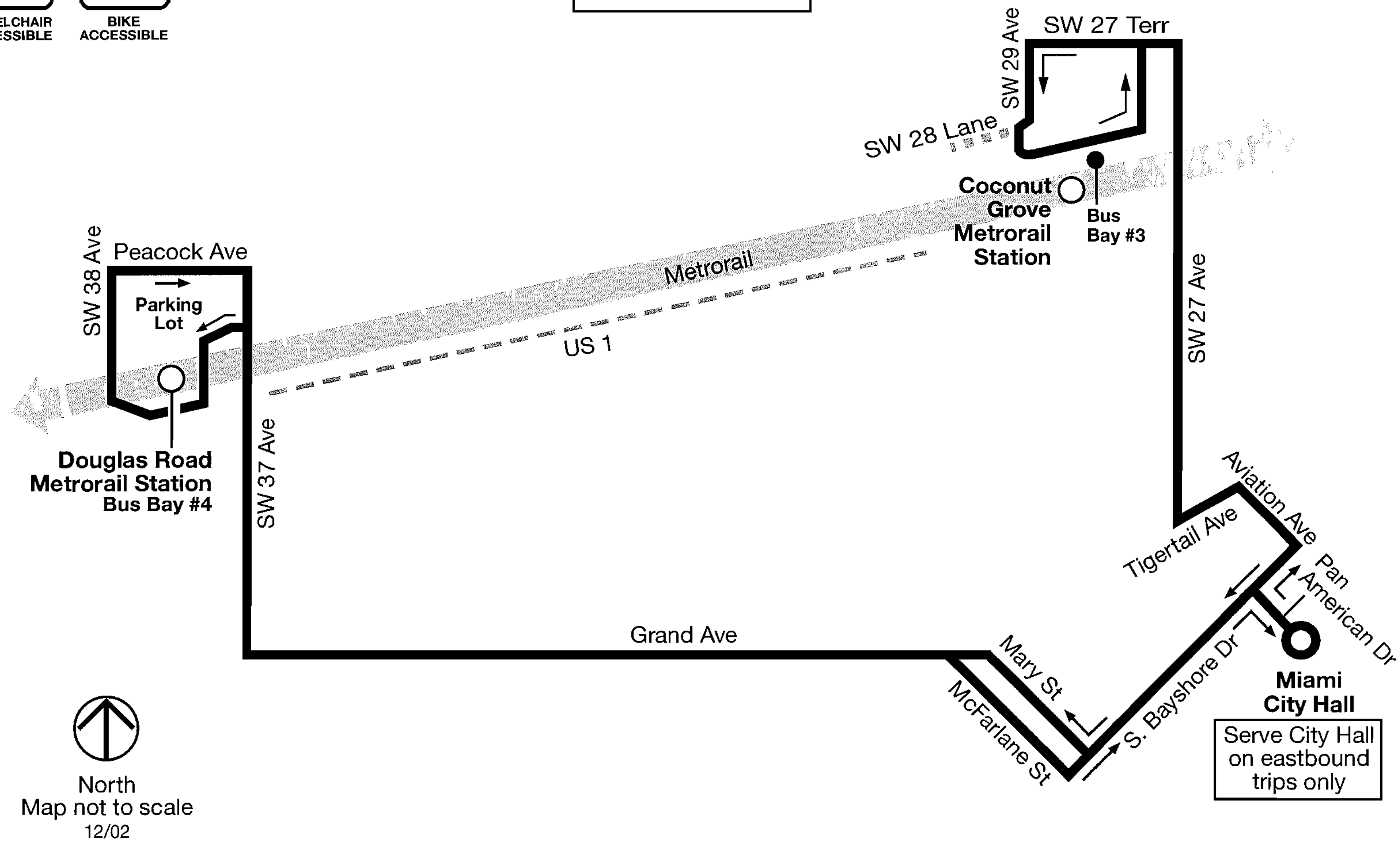
Coconut Grove Circulator

Route 249

WHEELCHAIR ACCESSIBLE

BIKE ACCESSIBLE

Free Fare



EFFECTIVE: December 22, 2002

TECH MEMO # 3

METRORAIL/COCONUT GROVE CONNECTION STUDY

DRAFT

TECHNICAL DATA DEVELOPMENT

Technical Memorandum Number 3

Prepared for

MIAMI-DADE MPO
Metropolitan Planning Organization

Prepared by

RS&H

Reynolds, Smith and Hills, Inc.

6161 Blue Lagoon Drive, Suite 200

Miami, Florida 33126

November 2004

TABLE OF CONTENTS

SECTION **PAGE**

LIST OF FIGURES

TITLE **PAGE**

LIST OF TABLES

TITLE **PAGE**

1.0 INTRODUCTION

The Miami-Dade County Metropolitan Planning Organization, (MPO), has commissioned a Study to investigate the feasibility of establishing an exclusive right of way transit connection between the Metrorail line and the Coconut Grove Village Center, located in Miami-Dade County, Florida. This Technical Memorandum has been prepared as one in a series of documents needed to support the Study, in accordance with the scope of services for the project.

The purpose of this Technical Memorandum is to document the general characteristics of the available transit technologies and make preliminary assessments of the suitability of each technology for the Metrorail/Coconut Grove Connection, based on the general characteristics. Data assessed for each transit mode include, the characteristics of the physical facilities, right of way requirements, operational capabilities and broad systems costs. The report provides information that can be used to screen the alternative transit modes and generate a shortlist of technologies that may warrant further analyses. In Phase 2 of the project, a more detailed analysis of the short listed alternatives will be conducted. At that state, estimates of patronage needs and demands will be assessed and a preferred transit alternative developed.

2.0 STUDY AREA

Figure 1 shows a location map for the project corridor. The Metrorail line runs parallel to US-1 with an existing station (Coconut Grove Station) located at SW 27 Avenue. The Coconut Grove Village Center is located approximately 0.75 miles east of the Coconut Grove Station. The proposed corridor for the exclusive right of way transit connection includes SW 27 Avenue, South Bayshore Drive, McFarlane Road, Grand Avenue, Mary Street and Tigertail Avenue.

RS&H

Reynolds, Smith and Hills, Inc.

Architecture, Engineering and Planning

PROJECT LOCATION MAP

FIGURE 1

3.0 GENERAL ROUTE CHARACTERISTICS

3.1 Right of Way

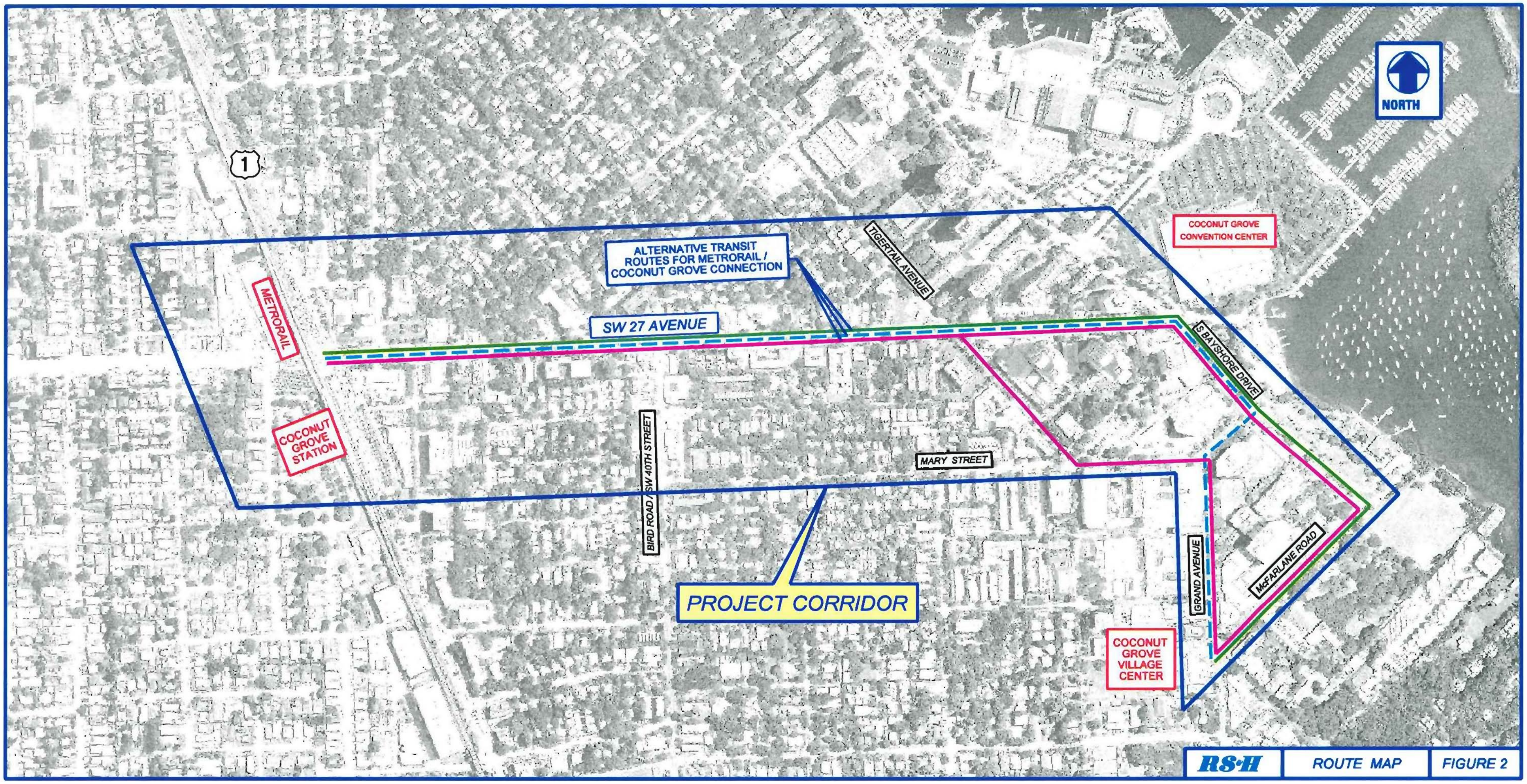
Figure 2 shows three proposed initial transit routes for the Metrorail/Coconut Grove Connection. Routes 1 and 2 run along SW 27 Avenue to the Convention Center - then from the Convention Center to the Village Center via South Bayshore Drive, Mary Street and Grand Avenue. Route 3 runs along SW 27 Avenue to the Convention Center - then from the Convention Center to the Village Center via Bayshore Drive and McFarlane Road - then from the Village Center to SW 27 Avenue via Grand Avenue, Mary Street and Tigertail Avenue. In all three routes, transit stations are proposed at SW 27 Avenue/US 1, SW 27 Avenue/Bayshore Drive and at the Village Center. Additional transit stops are proposed in Routes 2 and 3 as shown in Figure 2.

The existing right of way (ROW) width on SW 27 Avenue is between 80-100ft. South Bayshore Drive –with a landscaped median—has a ROW of 100 feet. The ROW on McFarlane Road is between 80-100 feet.

3.2 Possible Limiting Factors

Presently, full size (44 passenger) and shuttle-type buses comprise the existing transit modes serving Coconut Grove Area and connecting to Metrorail Station. In evaluating modes other than bus, certain limiting factors should be considered, such as: ROW availability; ROW cost; noise; visual intrusion; neighborhood disruption; business damages and relocation of businesses and residences.

Generally, the interface with the existing built environment would require that an absolute minimum of additional ROW be acquired for modes requiring the removal of traffic lanes or addition of exclusive right of way. In addition, converting existing automobile lanes to transit ROW would be prohibitive in most cases, given the travel demand needs.



RS&H | ROUTE MAP | FIGURE 2

4.0 TRANSIT MODES CHARACTERISTICS

The following sections describe the general characteristics of alternative transit technologies that are currently available.

4.1 BUS RAPID TRANSIT (BRT)

- **Physical Facilities**: Most BRT projects use conventionally-powered buses (internal combustion diesel engines). BRT's may also use electric propulsion or diesel/hybrid propulsion systems. Boarding and de-boarding may be from low floor (curb height) platforms or from high platforms. Vehicles may be standard transit buses, articulated or double articulated – all using rubber tires. Bus lengths range from 40 feet for conventional buses, 60 feet for articulated buses and 80 feet for double articulated buses. BRT's may operate on conventional roads or on guided bus ways. Guided buses have a set of horizontal steering wheels located alongside the vehicle, or use track guide similar to rail vehicles. Guided buses can operate within a narrow ROW, reducing the amount of land required. Guided buses are capable of leaving the bus way and operating on regular streets. Typical station spacing range from ¼ to 1 mile. Connection to existing bus / rail stations requires no further facilities; construction of future bus stations requires minimal facility construction and, most likely, no ROW acquisition. Maintenance and storage facilities may need to be altered and/or expanded to accommodate this mode.

- **Right of Way Requirements**: BRT's may operate in mixed traffic with signal priority, designated right-of-way, or on exclusive right-of-way (busway). Operations with exclusive right of way permit higher speeds and avoidance of delays from general traffic flows. Typical busway configuration consists of two lanes, one in each direction. Some busways are "reversible" single-lane facilities that operate towards the major employment center in the morning and from them in the evening.

- **Operational Capabilities**: The passenger carrying capacity of buses used in BRT systems range from approximately 40 for standard buses to 140 on articulated buses (seated + standing passengers). BRT's on exclusive busways can have practical operating headways of about one minute and ultimate capacity of approximately 6,000 persons per hour peak direction.

- **Systems Costs**: The capital cost for BRT systems is relatively low when compared to other transit technologies – the cost per mile is in the range of $2.5 to $2.9 million, excluding right of way costs. Construction for phase one of the South Miami-Dade Busway was approximately $5 million per mile including right of way costs. Cost per vehicle range form about $300,000 for conventional standard buses to over $1,600,000 for specialized BRT vehicles. Ongoing operating and maintenance costs can be high especially for systems servicing high demand routes.

- **Design / Construction:** Special vehicle procurement would likely be needed for the implementation for this mode. Design and construction would be in the range of one to two years.

- **Passengers / ADA**: Standard busses accommodate +/- 44 seated passengers. Standard modern vehicles do not meet strict ADA requirements; special ADA boarding equipment is supplied on a percentage of the fleet's busses.

- **Environmental**: While portions of the fleet are being converted to cleaner burning fuel, the bulk of the fleet is powered by diesel engines causing emissions concerns; noise pollution also a concern.

- **Summary:** Construction of exclusive bus lanes would be required to provide a BRT system operating in an exclusive right of way. Preliminary investigations indicate that right of way dedicated on 27th Avenue is adequate to accommodate construction of an exclusive bus lane facility adjacent to the existing general purpose lanes. The right of way dedicated for 27th Avenue is 80 feet between US 1 and Bird Road and 100 feet between Bird Road and South Bayshore Drive. The existing roadway that has been constructed within the right of way consists of only two lanes – one in each direction. Nonetheless, it is not clear, at this stage, whether or not property acquisition would be required to construct an exclusive bus lane facility along the corridor. However, given the relative low capital cost when compared to other technologies, the BRT system is considered to be a suitable technology for more detailed study in Phase 2 of this project.

4.2 TROLLEY BUS SERVICES

- **Physical Facilities**: Trolley bus services use rubber tire vehicles that are electrically propelled by a motor drawing current from overhead wires via a connecting pole (the trolley) form a remote central power source. Some modern models have the ability to operate off-wire for several blocks. Civil works include the construction of steel towers to support the overhead electric lines. Construction involved would have minimal, if any, interference with existing traffic lanes. Connection to existing rail / bus stations would require little or no new facilities; construction of future Trolley stations would require minimal expenditures. Maintenance and storage facilities would be needed near the

project, most likely north of the 27 Avenue Metrorail station; sufficient property in this area may not be available for a full scale facility.

- **Right of Way Requirements**: Trolley bus services operate with mixed traffic – no exclusive right of way is typically provided for these systems. This system does not require the condemnation of private property for right of way acquisition.

- **Operational Capabilities**: Since these vehicles operate with mixed traffic, practical headways are dependent on the general traffic operating conditions within the corridor. System reliability is therefore severely compromised in congested traffic conditions

- **Systems Costs**: Trolley bus services have a relatively low initial capital cost and moderate on-going operations and maintenance costs.

- **Design / Construction**: The design and construction would range from 2-3 years.

- **Passengers / ADA**: The system would follow strict ADA transit guidelines if all Trolleys were equipped with special ADA handling equipment.

- **Environmental**: This system is environmentally friendly from both an emission and noise perspective.

- **Summary:** Trolley Bus Services typically do not operate in an exclusive right of way. The reliability of Trolley Bus Services is dependent on the prevailing general traffic operating conditions along the road network. This technology is therefore not expected to fulfill the primary objective of the desired transit facility, i.e., to quickly and efficiently transport transit users between the Metrorail Station and locations within Coconut Grove, particularly during special events when the road network is congested. Therefore, Trolley Bus Services is not recommended for further consideration in this project.

4.3 AERIAL CABLEWAY PEOPLE MOVER (ACPM)

- **Physical Facilities:** ACPM's are fully automated, driverless people movers that have a long history of passenger service at mountain resorts around the world and are now being installed as practical transit systems in appropriate urban applications. These suspended cable transit systems consist of passenger vehicles supported by one or more suspension and propulsion cables. The passenger cars are not self propelled, and guidance and propulsion are provided by moving a suspension cable from a centralized drive system at one of the end stations. Redundant drive systems are provided and the automatic train control (ATC) systems are fail safe and triple redundant. Civil works for the line consists of steel towers with concrete traffic barriers spaced at 300 to 700 feet. Towers may be placed in the centerline of the roadway or can be constructed as cantilevers allowing for flexibility in placement along the corridor. Stations can be structural steel or concrete and can utilize at-grade, plaza style passenger platforms or elevated platforms, as each case may dictate. Connection to existing transit stations may be accomplished with the ACPM platforms in close proximity to (alongside) the existing platforms. Facilities such as pedestrian walkways, bridges, escalators, moving walkways, etc. can be constructed to link the transfer stations. ACPM technology has the ability to easily cross over the existing Metrorail elevated guideway, if necessary, and cross US 1 with no structures interfering with the intersection. Most of the passenger vehicles can be stored within the stations when the system is not in service and do not need a separate storage facility; a separate small facility (100 sq. ft. per vehicle) is required for

maintenance and storage of the remaining vehicles to be used for capacity adjustment. This maintenance / storage facility could be located at the Metrorail, Convention Center, or MacFarlane station locations without additional property acquisition.

- **Right of Way Requirements:** ACPM suspended/cableway transit systems operate in an exclusive right of way, 20 to 60 feet above street level; the aerial pathway required is from 35 feet to 45 feet wide along the route. Supporting system towers are widely spaced along the route and have footprints ranging from 30 inches to 36 inches typically. Boarding and de-boarding may occur at high platform level stations or at low ground level stations.

- **Operational Capabilities:** Carrying capacity ranges from 1,000 persons per hour per direction to over 4,000 persons per hour per direction for single systems. Route lengths range from one half of a mile to five miles. Passenger cabins for gondola style systems range from 8 persons per cabin to 30 persons per cabin; cabins can be air conditioned, heated, ventilated, video monitored, lighted and sound equipped. Headways are typically 10 to 60 seconds; this means that when passengers arrive at a station there is always a vehicle waiting – this is the only people mover system that offers continuous walk up and board service with no wait times. Operating speeds range from 13 to 17 mph – the relatively low operating speeds would result in long rides along longer routes. This would not be a factor for the Metrorail/Coconut Grove Connection since the route would be no more than about a mile in length. In the event of a system failure, there are 2 redundant, separate backup drive systems to return the vehicles to the stations; if the primary, secondary and evacuation drives all fail to return cabins to the stations, passengers can be removed from cabins by cherry pickers, fire trucks, lowering devices or similar equipment – historically this type of evacuation is a one in 20 – 30 year event. System availability for ACPM's is normally over 99.5%; ACPM's can operate 365 days per year, with maintenance and inspections carried out during normal shutdown hours. Monocable system may operate in wind speeds of up to 50 mph – multicable systems can operate in wind speeds of up to 60 mph.

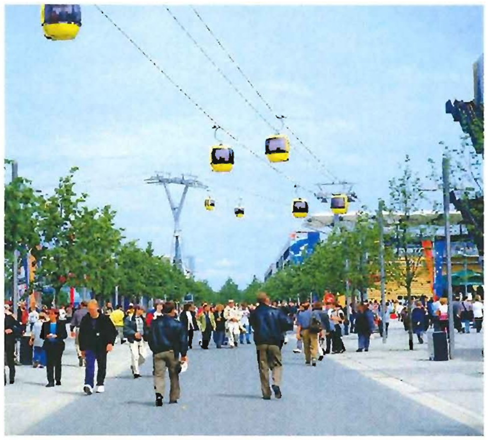
- **Systems Costs:** ACPM systems are relatively low cost when compared with other transit technologies. For high capacity, in urban environments, capital costs per mile range from about $10 million to $20 million, depending upon route characteristics and number and design of stations. Operating and maintenance costs are low to moderate, compared to other transit modes.

- **Design / Construction:** The period required for design and construction of an ACPM system is the shortest for any of the elevated people mover class. Typically, the design and construction of a system similar to the Coconut Grove Corridor can be fully realized in 12 to 18 months. Also, due to the aerial ROW, the 300 to 500 foot support tower spacing, minimal civil works and minor at-grade construction work, ACPM construction is the least disruptive to traffic, roadways, businesses, neighborhoods and the natural environment. ACPM's do not create physical barriers between neighborhoods.

- **Passengers / ADA:** Normal boarding and de-boarding occurs at the rear platform of end stations and the side platforms of intermediate stations; vehicles are propelled to and from the boarding areas by a cabin conveyor system. Cabins and platforms are fully ADA compliant; wheelchairs, disabled persons and elderly persons have no problem entering and exiting the station, platforms and gondola cars.

- **Environmental:** By virtue of their exclusive right of way, cable type guideway, and their electrical drive systems, aerial cableways are the most ecologically friendly form of people movers with no air pollution, no noise pollution and minimal support structure footprints on the ground.

- **Summary**: ACPM Aerial Cableway Transit systems provide the opportunity for a relatively inexpensive transit system operating in an exclusive aerial right of way. It is expected that this system could be installed with minimum, if any, right of way impacts along the project corridor. This system has the flexibility to easily adjust to varying passenger carrying capacities to meet low and high demand levels by automatically removing or adding vehicles to and from the line. Further, this is a proven technology with over 1,000 operating systems around the world and a safety record that meets or exceeds all other transit modes, due to its exclusive aerial right of way characteristic. Based on this preliminary assessment, the Aerial Cableway ACPM transit system is recommended for further detailed evaluation in Phase 2 of the project.



4.4 AUTOMATED GUIDEWAY TRANSIT (AGT)

- **Physical Facilities:** Automated guideway transit systems operate on customized guidance rails. Propulsion is provided by electric traction motors with third rail high voltage power. The typical spacing between stations is relatively short, ranging from about 0.25 to 0.5 miles apart. The train systems are fully automated and do not require an operator in the passenger cars. Civil works consists of the

construction of elevated guideway with substantial concrete support structures, spaced about 80 to 120 feet along the route. Civil works for stations are also fairly massive concrete structures. The associated civil works can have substantial traffic impacts and right of way acquisition. Connection to existing bus / rail stations requires construction of an AGT platform which would interface with the Metrorail Station. The station would be approximately 200' long, 30' wide, and 40' in height. Substantial additional ROW and massive civil works would be required at the Metrorail station area; it is not clear whether sufficient ROW is even obtainable for such interface. Maintenance and storage facilities would have to be designed and constructed; these are also massive and square footage intensive

- **Right of Way Requirements:** Automated Guideway Transit systems operate in an exclusive right of way that is fully grade separated; no at-grade street or pedestrian crossings are permissible. High platforms must be provided at all stations.

- **Operational Capabilities:** Maximum operating speed for these systems range from about 50 to 60 mph. Capacity of individual passenger cars range from about 50 to 200 passengers. Vehicles may come in various lengths, ranging from about 10 feet to 60 feet. Passenger vehicles operate in trains of 2 to 6 cars. Minimum, practical headway is about 1.25 minutes – ultimate capacity up to 40,000 passengers per hour per direction.

- **Systems Costs**: Automated Guideway Transit systems have a high initial capital cost – cost per mile range is about $100 to $150 million. Ongoing operating and maintenance costs are also very high.

- **Design / Construction**: The design and construction period would range from 4-7 years.

- **Passengers / ADA**: The system would be in full ADA compliance.

- **Environmental**: Emissions would be minor but noise, visual intrusion and neighborhood disruption would be substantial.

- **Summary:** Automated Guideway Transit systems have very high associated costs when compared with other transit technologies. Extremely high passenger demand would be needed on a consistent day-to-day basis to justify the capital expenditure plus the operating and maintenance costs for such an AGT transit system. The project corridor is not expected to generate the high level of consistent passenger demand needed to support this system. In addition, this system would have a high visual impact requiring possible, substantial, right of way acquisition. Based on these factors, automated guideway systems are not recommended for further consideration in this project.

4.5 LIGHT RAIL TRANSIT (LRT)

- **Physical Facilities**: Light Rail Transit systems consist of electrically powered vehicles operating on fixed steel rails. Guidance is provided by the railroad rails and propulsion is provided by electric traction motors with overhead power collectors. Civil works for exclusive right of way operation involve the construction of at-grade rail lines that may require right of way acquisition all along the route. Station spacing for light rail systems typically range from about 0.5 to 2 miles. Connection to existing bus / rail stations may require an elevated crossing of US1, which in turn would call for ROW acquisition. The balance of the system may run at-grade with the possible exception of the steeper sections of 27 Avenue and McFarlane Road which may exceed 4%. Maintenance

and storage facilities are significant and would have to be designed and constructed; additional right of way acquisition is likely for such facilities.

- **Right of Way Requirements**: Flexibility in location is the primary defining attribute that separates LRT from other rail modes. These systems may operate in exclusive right of way or shared right of way. The systems may use grade separated crossings, longitudinally separated from other traffic, surface streets with tracks and priority at intersections. Reserve lanes and pre-emption/prioritization of traffic lights are necessary for high levels of service reliability within street right-of-way.

- **Operational Capabilities**: Maximum operating speeds range from about 35 to 60 mph. Capacity of individual passenger cars is about 70 to 200 passengers. Train lengths consist of up to four passenger cars. These systems serve moderate to high passenger volume, ranging from about 3,600 to 22,000 persons per hour per direction (PHPD). Practical operating headway is about three minutes. Vehicles and support systems are competitively available from numerous sources.

- **Systems Costs**: The initial capital cost for LRT systems is moderate when compared with other technologies - cost per mile is about \$20 to \$40 million. Cost of individual vehicles ranges from about \$1.5 to 3.0 million. On-going operating and maintenance costs are low to moderate.

- **Design / Construction**: The design and construction would require between 3-6 years.

- **Passengers / ADA**: Fully compliant with ADA.

- **Environmental**: Acceptable levels of air and noise pollution; a good neighbor except for the noise of steel wheels on steel tracks and occasional screeching brakes coming into stations.

- **Summary:** Light rail transit systems can provide high passenger capacity within an exclusive right of way and at a relatively moderate cost depending on the amount of ROW acquisition required, if any. This technology is recommended for further detailed analysis in Phase 2 of the project.

4.6 HEAVY RAIL TRANSIT

- **Physical Facilities:** Elevated Heavy Rail Transit includes electrically powered rail systems operating in an exclusive right of way. Guidance is provided by standard railroad track and propulsion is provided by electric traction motors with third rail power. Civil works consists of the construction of elevated concrete support structures, spaced about 60 to 100 feet along the route. Civil works for stations also involve massive concrete structures. The associated civil works can have substantial traffic impacts and right of way acquisition. Typical corridor lengths 10 to 15 miles. Stations spacing range from about 0.5 to 5 miles apart. The connection to The Coconut Grove Metrorail station would be a major public transit initiative. The station itself would need to be augmented with a new station either to the north of the existing station or on the south side of US1. In any case, the minimum turning radius of 1000' as well as the station's size of approximately 500'x50'x50' would require a multi-million dollar ROW acquisition program. Maintenance and storage could be accommodated with existing facilities at the Lehman Yard.

- **Right of Way Requirements**: Heavy rail systems require an exclusive right of way that is fully grade separate - no at-grade street or pedestrian crossings are permissible for safety reasons. High platforms must be provided at all stations.

Logistics for connecting to existing metro rail station will be complicated and expensive.

- **Operational Capabilities**: Maximum operating speeds for heavy rail systems may exceed 70 mph. The capacity of individual passenger cars ranges from about 70 to 130 passengers. Train lengths vary for 2 to 10 cars. The practical headways for these systems can be as short as two minutes and the ultimate capacity about 60,000 passengers per hour per direction.

- **Systems Costs:** Heavy rail systems have very high initial capital cost - cost per mile ranges form about $100 to $250 million. Ongoing operating and maintenance costs are moderate.

- **Design / Construction**: The design and construction of this extension to Metrorail ranges from 4-10 years.

- **Passengers / ADA**: The system is ADA compliant.

- **Environmental**: The system is loud, visually obtrusive, and will require extensive neighborhood re-characterization.

- **Summary:** Heavy Rail Transit systems have very high associated costs when compared with other transit technologies. High passenger demand would be needed on a consistent day-to-day basis to justify the capital expenditure plus the operating and maintenance costs for a heavy rail transit system. The project corridor is not expected to generate the high level of consistent passenger demand to needed to support this system. In addition, this system would have a high visual impact and is not intended to be a neighborhood feeder system. It is a line-haul system. Based on these factors, heavy rail systems are not recommended for further consideration in this project.

4.7 MONORAIL

- **Physical Facilities:** Monorails are automated train control systems that are supported on a single beam. Guidance for the monorail is provided by the center guide beam and propulsion is provided by electric traction motor with third rail power. Civil works consists of the construction of elevated concrete support structures, spaced about 80 to 120 feet along the route. Civil works for stations are also involve fairly massive concrete structures. The associated civil works can have substantial traffic impacts and right of way acquisition. Spacing between stations range form about 0.5 to 1 mile apart. Existing systems are proprietary - vehicles and support systems are available from limited suppliers. Connection to existing bus / rail stations requires construction of a Monorail platform which would interface with the Coconut Grove Station. The station would be approximately 200' long, 30' wide, and 40' in height. Substantial additional ROW would be required. Maintenance and storage facilities would have to be designed and constructed.

- **Right of Way Requirements:** Monorails require exclusive right of way that is fully grade separated - no at-grade street or pedestrian crossings are permissible for safety reasons. High platforms must be provided at all stations.

- **Operational Capabilities**: Monorails have a maximum operating speed of about 35 to 55 mph. Trains typically contain up to four passenger cars. The capacity of individual cars is about 60 seats. With driverless operation, practical operating headways can be as short as 1.25 minutes – ultimate capacity about 20,000 persons per hour peak direction.

- **Systems Costs:** Monorail systems have high initial capital cost – cost per mile ranges from about $100 to $150 million. Individual vehicle cost is about $1 to $2 million. Operating and maintenance costs are also high

- **Design / Construction:** The design and construction would range from 4-7 years.

- **Passengers / ADA:** The system would be in ADA compliance.

- **Environmental:** Emissions would be minor but noise, visual intrusion and neighborhood disruption would be substantial.

- **Summary**: Monorail systems have very high associated costs when compared with other transit technologies. High passenger demand would be needed on a consistent day-to-day basis to justify the capital expenditure plus the operating and maintenance costs for a monorail system. The project corridor is not expected to generate the high level of consistent passenger demand to needed to support this system. In addition, this system would have a high visual impact. Based on these factors, monorail systems are not recommended for further consideration in this project.

5.0 CONCLUSIONS

Establishing an exclusive right of way transit connection between the Metrorail line and the Coconut Grove Village Center presents a unique challenge for planners and engineers due to many established constraints within this particular built environment. Two general exclusive right of way options are available in this circumstance: 1) an at-grade exclusive right of way along the roadways, and 2) an aerial exclusive right of way above the roadways. The at-grade exclusive right of way option will, most likely, require public and private property acquisition to accommodate the extra pathway width for the exclusive bus or rail lanes. Using an aerial exclusive right of way system may, or may not, require surface right of way acquisition, depending upon the mode being studied and extent of support structure civil works.

The studied modes requiring an at-grade exclusive right of way are BRT and Light Rail; the modes requiring an aerial right of way are Aerial Cableway People Movers (ACPM), Automated Guideway Transit (AGT), Heavy Rail, and Monorails. BRT needs 2 dedicated traffic lanes and Light Rail requires 2 dedicated rail lanes. Dual guideway AGT Systems, Heavy Rail and Monorails necessitate significant support structure civil works that often interfere with traffic lanes or take over traffic lanes; Cableway ACPM Systems require widely spaced centerline of roadway support towers, that normally do not require lane closure or lane interference, or offset cantilevered towers that are out of the roadway altogether.

As per the above sections, Trolley Bus Service, Automated Guideway Transit, Heavy Rail and Monorails have been recommended to be eliminated from consideration in Phase 2, due to not meeting specific requirements of the desired transit service for the Metrorail/Coconut Grove Connector. During the above review of transit modes, Bus Rapid Transit, Aerial Cableway People Movers and Light Rail did meet the criteria for the desired transit service, i.e., exclusive right of way, routing, delivery of passenger capacity and interface with the existing Metrorail multi-modal station at U.S.1 and 27th Avenue. Two of the modes operate on a surface exclusive right of way (BRT and LRT), and one mode operates in an aerial exclusive right of way (ACPM). All three modes meet the travel time, frequency of service and passenger carrying capacity criteria for the transit corridor.

It is the finding of this Study that these three remaining modes have high public transit applicability for the Metrorail to Coconut Grove Connector and it is recommended that BRT, ACPM and LRT technologies be studied in detail in Phase 2 of this Study requested by Miami-Dade MPO. Phase 2 will generate estimates of patronage needs and demands for the Connector, which will be assessed and a preferred transit alternative developed.

Table 1 on the following page shows an estimated cost comparison for the alternative transit modes. The matrix in Table 2 summarizes the characteristics of the transit modes considered for this study.

TABLE 1
COST COMPARISON - TRANSIT MODES

COCONUT GROVE / METRORAIL CONNECTOR AVERAGE TRANSIT MODE COSTS PER MILE (@ 3 STATIONS)										
TRANSIT MODES	Operating Equipment	Storage / Maintenance	Fixed Facilities / Stations	Construction Guideway / Roadway	ROW Acquisition	Total Capital Costs / Mile	Annual O&M Costs	Equipment Replacement Reserve	Facilities Replacement Reserve	Total Annual Costs / Mile
ENHANCED BUS SERVICE	2,500,000	0	1,000,000	0	0	3,500,000	2,500,000	250,000	20,000	2,770,000
BUS RAPID TRANSIT (BRT)	5,000,000	3,000,000	1,000,000	5,000,000	0	14,000,000	3,000,000	500,000	20,000	3,520,000
TROLLEY BUS	7,000,000	3,000,000	5,000,000	5,000,000	0	20,000,000	4,500,000	700,000	100,000	5,300,000
AERIAL CABLEWAY (ACPM)	10,000,000	2,000,000	10,000,000	3,000,000	0	25,000,000	4,000,000	400,000	200,000	4,600,000
AUTOMATED GUIDE-WAY TRANSIT (AGT)	25,000,000	5,000,000	20,000,000	50,000,000	50,000,000	150,000,000	8,000,000	1,000,000	400,000	9,400,000
LIGHT RAIL TRANSIT (LRT)	30,000,000	5,000,000	5,000,000	10,000,000	0	50,000,000	6,000,000	1,200,000	100,000	7,300,000
HEAVY RAIL	50,000,000	10,000,000	30,000,000	75,000,000	50,000,000	215,000,000	10,000,000	2,000,000	600,000	12,600,000
MONORAIL	25,000,000	5,000,000	20,000,000	50,000,000	50,000,000	150,000,000	8,000,000	1,000,000	400,000	9,400,000

NOTES: All system costs assume 3 passenger stations per mile; bus and LRT stations are at grade and aerial right of way stations are elevated.
Bus systems assume a fleet of 5 busses per mile.
Aerial right of way and LRT systems assume a maximum passenger carrying capacity of 3,000 passengers per hour per direction.
It is assumed that BRT, Trolley Bus, ACPM, and LRT systems will not require ROW acquisition; after further study, ROW may be required.

TABLE 2
COMPARISON MATRIX - TRANSIT MODES

Modes	Physical Facilities	ROW Requirements	Operational Capabilities	Systems Costs	Design / Construction	Passengers / ADA	Environmental	Summary
Bus Rapid Transit (BRT)	- Conventionally-powered (internal combustion diesel engines). - Electric propulsion or diesel/hybrid propulsion systems. - Vehicles can be standard transit buses, articulated or double articulated using rubber tires. Lengths vary between 40 to 80 ft.	- Mixed Traffic with signal - Designated ROW - Exclusive ROW	- Capacity buses - 40 to 140 passengers. - Headway about one minute. - Ultimate capacity up to 6,000 persons/hr/dir.	- Cost/mile - $2.5 to $2.9 million - Cost/vehicle - $0.3 to $1.6 million	1 to 2 years	New vehicles meet ADA requirements	- Emissions and pollution are concerns.	Recommended for more detailed evaluation
Trolley Bus Services	- Use rubber tire vehicles that are electrically propelled by a motor drawing current from overhead wires via a connection pole (the trolley) from a remote central power source. - Modern models have ability to operate off-wire for several blocks.	- Mixed Traffic - No exclusive ROW	- Headways dependent on the general traffic operating conditions within the corridor. - System reliability severely compromised in congested traffic conditions.	- Low initial capital cost. - Operations and maintenance costs are moderate.	2 to 3 years	Follow strict ADA guidelines if trolleys are equipped with ADA equipments.	- Environmentally friendly from emission and noise perspective.	Not recommended for further detailed evaluation
Aerial Cableway People Mover	- Automated, driverless people movers. - Suspended cable transit systems consist of passenger vehicles supported by one or more suspension and propulsion cable. - Guidance and propulsion provided by moving a suspension cable from a centralized drive system at one of the end stations.	- Exclusive ROW 20 to 60 ft above street level - Aerial pathway about 35 to 45 feet wide	- Ultimate capacity - 1,000 - 4,000 persons/hr/dir. - Passenger cabins range from 8 to 30 persons. - Headway typically 10 to 60 seconds - Operating speeds - 13 to 17 mph	- Cost/mile - $10 to $20 million. - Operations and maintenance costs are moderate.	12 to 18 months	Fully ADA compliant	- No air pollution - No noise pollution - Minimum support structure footprints on the ground.	Recommended for further detailed evaluation
Automated Guideway Transit (AGT)	- Operates on customized guidance rails. - Propulsion provided by electric traction motors with third rail high voltage power. - Spacing between stations range from 0.25 to 0.5 miles. - Stations are approx. 200 ft long, 30 ft wide and 40 ft in height - Support structures spaced about 80 to 120 feet apart.	- Exclusive ROW fully grade separated.	- Operating speeds range from 50 to 60 mph. - Capacity of passenger cars - 50 to 200 passengers. - Vehicles lengths - 10 to 60 ft. - Each train contains about 2 to 6 cars - Headway is about 1.25 min - Ultimate capacity up to 40,000 passengers/hr/dir.	- Cost/mile - $100 to $150 million - Operations and maintenance costs are very high.	4 to 7 years	Full ADA Compliant	- Emissions is minor. - Noise, visual intrusion and neighborhood disruption would be substantial.	Not recommended for further detailed evaluation

TABLE 2
COMPARISON MATRIX - TRANSIT MODES

Modes	Physical Facilities	ROW Requirements	Operational Capabilities	Systems Costs	Design / Construction	Passengers / ADA	Environmental	Summary
Light Rail Transit (LRT)	- Electrically powered vehicles operating on fixed steel rails. - Guidance provided by the railroad rails and propulsion provided by electric traction motors with over head power collectors. - Station spacing range from 0.5 to 2 miles.	- Exclusive or shared ROW. - Separate crossings separated from other traffic, surface streets with tracks and priority at intersections.	- Operating speeds range from 35 to 60 mph. - Individual passenger cars about 70 to 200 passengers. - Trains consist of up to 4 passenger cars. - Ultimate capacity - 3,600 to 22,000 persons/hr/dir. - Headway approx. 3 min	- Cost/mile - $20 to $40 million - Cost/vehicle - $1.5 to $3.0 million - Operations and maintenance costs are moderate.	3 to 6 years	Fully ADA Compliant	- Acceptable levels of air and noise pollution - Occasional screeching brakes coming into stations. - Steel wheels on steel tracks.	Recommended for further detailed evaluation
Heavy Rail Transit	- Electrically powered rail systems. - Guidance provided by standard railroad track and propulsion provided by electric traction motors with third rail power. - Support structures spaced about 60 to 100 feet. - Corridor Lengths range from 10 to 15 miles. - Station spacing range from 0.5 to 5 miles apart.	- Exclusive ROW fully grade separated. - High platforms must be provided.	- Maximum speeds may exceed 70 mph. - Individual cars ranges from about 70 to 130 passengers. - Train length vary from 2 to 10 cars. - Headways can be as short as 2 min - Ultimate capacity about 60,000 passengers/hr/dir.	- Cost/mile - $100 to $150 million - Operating and maintenance costs are moderate.	4 to 10 years	ADA Compliant	- Loud system, visually obtrusive, and require extensive neighborhood re-characterization.	Not recommended for further detailed evaluation
Monorail	- Automated train control systems supported on a single beam. - Guidance provided by the center guide beam and propulsion provided by electric traction motor with third rail power. - Elevated concrete support structures spaced about 80 to 120 feet. - Spacing between range from 0.5 to 1 mile. - Stations are approx. 200 ft long, 30 ft wide and 40 ft in height	- Exclusive ROW required. - Fully grade separated. - High platforms must be provided.	- Operating speeds - 35 to 55 mph. - Trains contain up to 4 passenger cars with about 60 seats each. - Headway can be as short as 1.25 min. - Ultimate capacity about 20,000 passengers/hr/direction	- Cost/mile - $100 to $150 million - Cost/vehicle - $1 to $2 million - Operating and maintenance costs are high.	4 to 7 years	ADA Compliant	- Emissions minor but noise, visual intrusion and neighborhood disruption substantial.	Not recommended for further detailed evaluation